Medicare for All: Health, Life, and the Economy

Hosted by Penn Wharton Budget Model

Wednesday, January 22, 2020

4:30 PM - 6:00 PM

Huntsman Hall, Room F85

Learn more and register at: whr.tn/m4a

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Panelists

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Kent Smetters: Boettner Chair Professor at the University of Pennsylvania's Wharton School and Faculty Director of the Penn Wharton Budget Model

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Financing Medicare Expansion in the U.S.

Felix Reichling[1] Kent Smetters[2]

[1]Penn Wharton Budget Model

[2]The Wharton School, Penn Wharton Budget Model, and NBER

January 22, 2020

Medicare-For-All: Key Points

- We project that under current law, the percent of the population without medical insurance will almost triple over the next 40 years.
- Examine a stylized mandatory single payer system ("M4A" for short) system that provides the same benefits currently available under Medicare to the working-age population.
- Lays the foundation for analysis of specific plans, which we will soon release, that expand Medicare benefits while performing additional cost cuts.

Medicare-For-All: Key Points

- Increases life expectancy by almost 2 years, grows the population size by 3 percent, and increases productivity by about 5 percent through improved health, before macroeconomic feedback effects.

- How M4A is funded, however, is critical for macroeconomic performance. Options:
  - A **premium** that is independent of a worker's labor income:
    - Increases GDP by 16 percent by 2060, through a combination of cost savings and productivity increases.
  - A **payroll tax** that is proportional to a worker's labor income:
    - Reduces GDP by 3.25 percent by 2060.
  - **Deficit financing**
    - Reduces GDP by 15 percent by 2060.

Medicare-For-All: Overview

To analyze, we built a heterogeneous-agent overlapping-generations general-equilibrium many-period life-cycle model that includes key interactions not previously considered:

- **Demographics**: health, longevity, worker productivity, different income/wealth levels
- **Insurance markets**: prices, adverse selection, moral hazard
- **Macroeconomy**: capital, labor, GDP, factor prices
- **Employer compensation**: wages vs. tax-deductible benefits
- **Related tax and spending programs**: multiple tax bases, debt, and programs implicitly or explicitly linked to Medicare (Medicaid, Social Security and SNAP).

... all within an internally consistent model that is carefully calibrated, validated to real-world data without overfitting.

Model: Overview

More specifically ...

Households:

- Different family compositions, incomes, wealth, health
- Uncertainty they face:
  - wages
  - health state
  - medical costs by health state
  - mortality
- Choices they make:
  - consumption
  - labor supply
  - insurance (before retirement)
  - OOP medical (insured or not)
- Interactions between health and productivity

Model: Overview

Firms:

- Tax deductible group health plans
- Competitive input prices (labor and capital) and outputs
  - Hence, eliminating health plan increases wages even without macro effects
- Constraint on minimum *wage* compensation
  - If marginal product of worker $<$ minimum wage, no employer-provided health benefit
  - Some workers reduce assets and labor income to get Medicaid
  - If not worth it, worker can still purchase on exchange
  - Or, uninsured worker can still pay OOP

Model: Overview

Equilibrium markets:

- Insurance premiums (allows for selection and hazard)
- Labor and capital prices (w/ international flows)
- 40-year policy transition path

Medicare-For-All: Overview

Government:

- Multi-tiered tax system
- Debt: currently assume growth rate $>$ government borrowing rate but less than MP_K (economy is still dynamically efficient)
- Medicare with differential overhead, growth costs relative to private (below)
- Medicaid:
  - income, non-housing asset tests
  - differential growth costs (below)
  - cost sharing by states
- Other major programs:
  - Social Security: payroll taxes, PIA bendpoint benefits
  - General welfare ("SNAP")

Medicare-For-All: Overview

Original data work and model calibration:

- Estimated new wage processes that better measure the impact of health
- Careful attention to calibration at micro and macro level with detailed modeling, not ad factors.
- Numerous over-identification validations, including cross-tabs

Equilibrium fixed point accommodates endogenous productive abilities and population size.

Medicare-For-All: Overview

Some examples of complex interactions:

- Eliminate employer-based health tax deduction → raises *reported* wages in competitive labor market → expands Social Security payroll base (and future benefits) and income tax base → reduces debt and labor supply *cetris paribus* → increases investment → raises *real* (not just reported) wages.
- "Premium financing" (see below) → premiums partly financed by Medicaid for low-income households → partly disconnects payment-benefit linkage, and some households will even save and work less to qualify.
- Bidirectional interactions between health, income and wealth; in some cases under current law, producing a bifurcated uninsured cost distribution due to simultaneous adverse selection and health-income "poverty traps" ("despair").

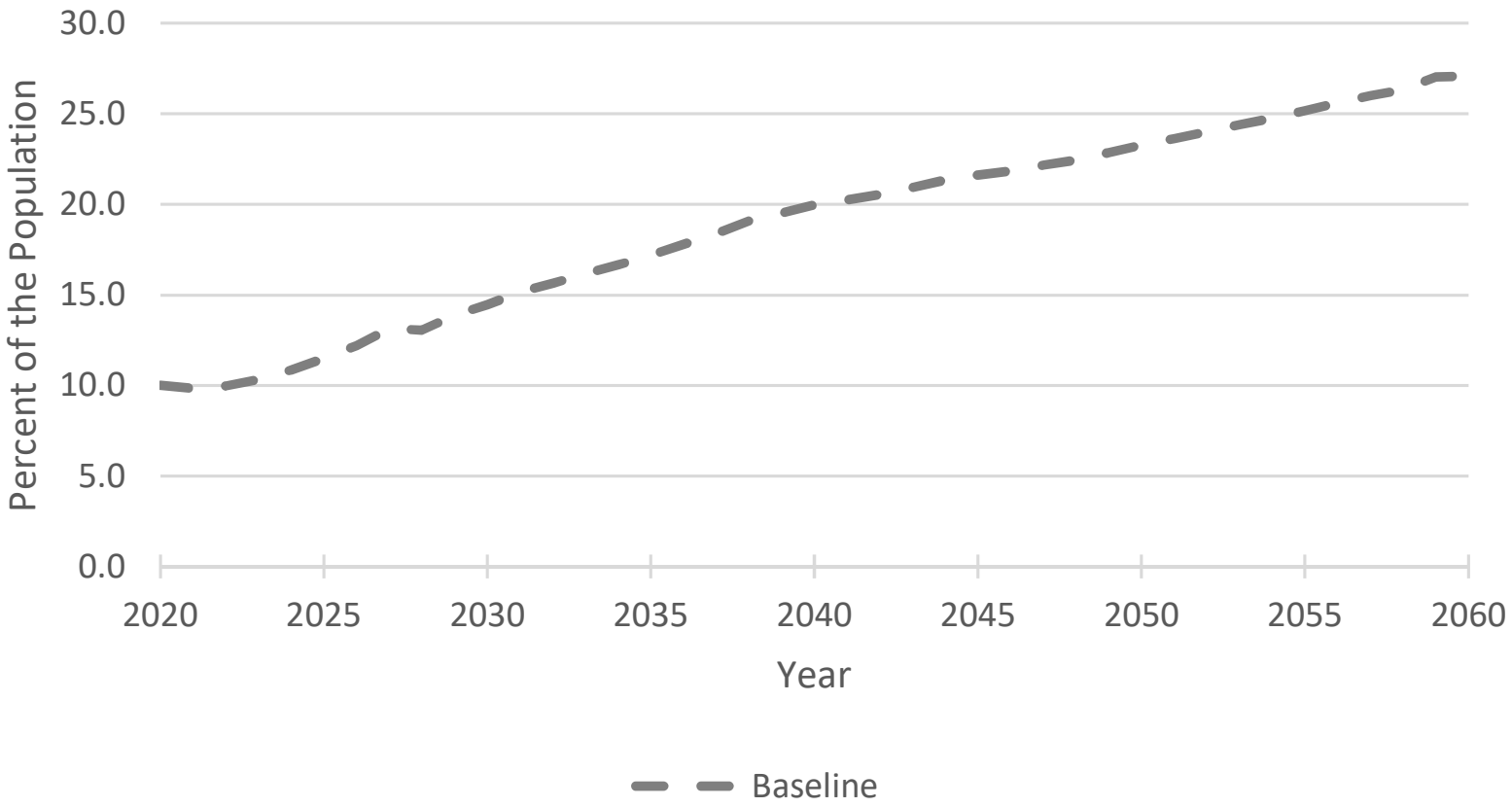
Medicare-For-All: Overview

Interesting issues, but not relevant for this analysis (would be the same across financing methods):

- Supply expansion rigidities
- "Health state" differentiate by diagnosis, not just overall score
- Distinctions by race not well proxied by income and wealth
- Regional differences (in imperfect competition)
- Medicare FFS and Medicare Advantage treated separately instead of weighted average of admin costs

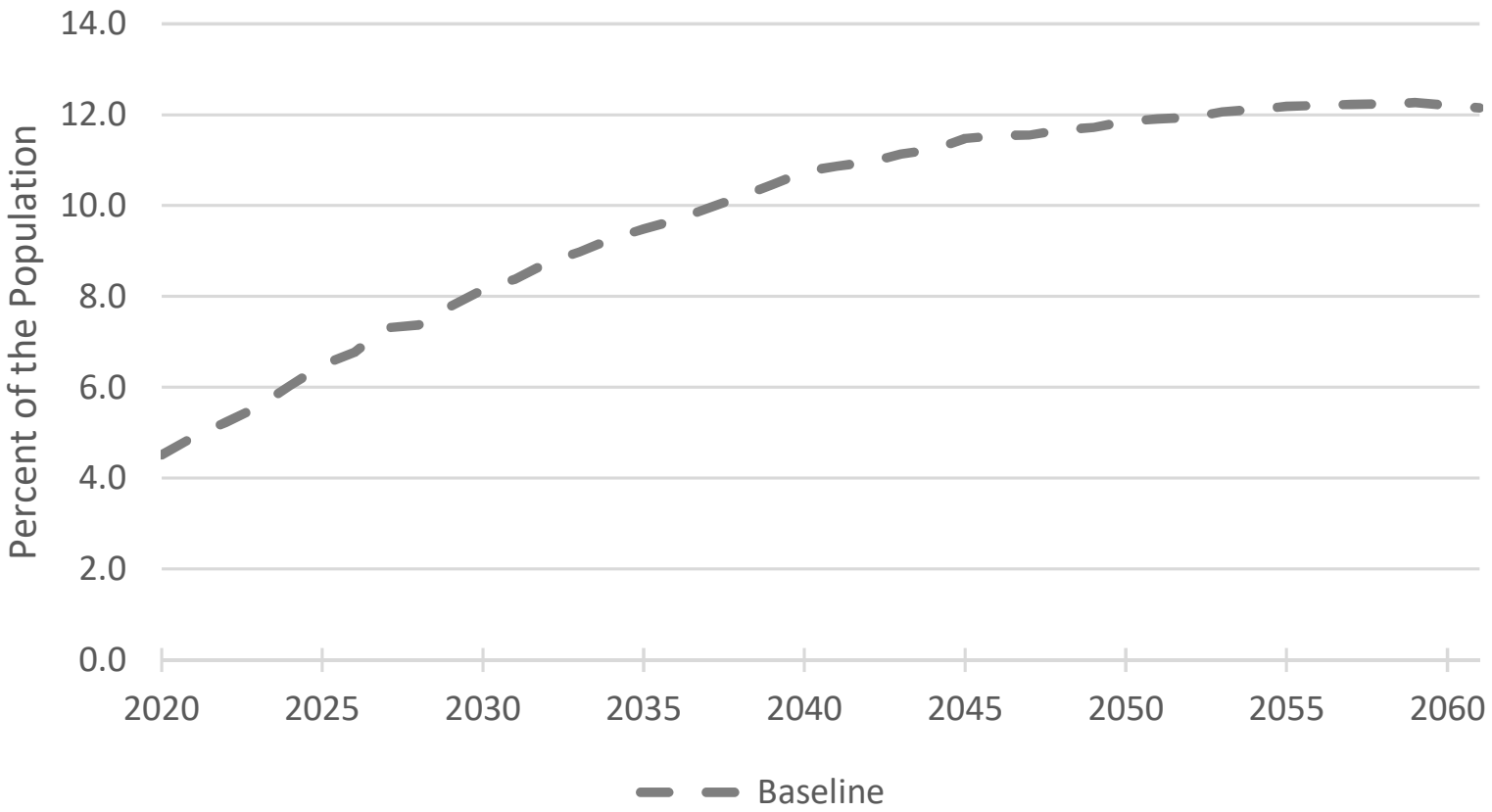
Current Law

We project households w/o insurance triples by 2060, largely due to excess cost growth and related macro-effects.



Current Law

Similar for households w/o medical treatment (i.e., don't pay OOP)



A Pure (Stylized) Medicare-For-All

- Medicare under current law remains unchanged (i.e. same services covered, same co-pays)
- No expansion of benefits
- Working-age would enroll in the same program
- For the working-age population, Medicare initially reimburses providers at current rates and slowly reduces over time (at Medicare excess cost growth rate), not a sudden jump down.

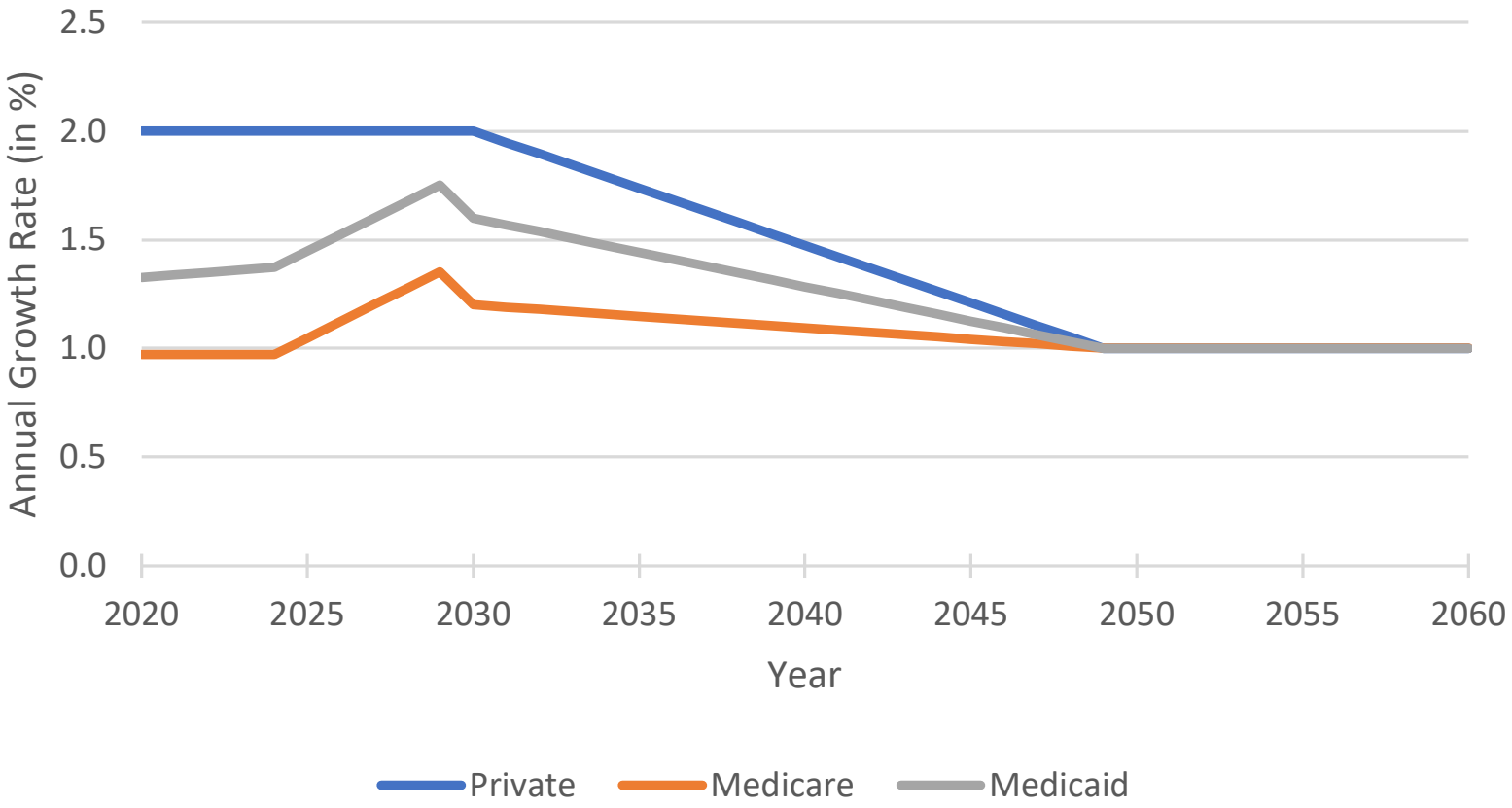
Will release Sander's plan analysis soon

Common features of our M4A scenarios

- Policy change starts in 2021
- Medicare replaces private health insurance
- Tax-advantaged treatment of EPHI discontinued
  - Employers competitive pay health insurance subsidy out as cash wage
- Medicare's administrative costs and projected excess cost growth are unaffected
- Current Medicare budget imbalance doesn't get fixed

Administrative Costs

Admin costs lower in Medicare and slower excess cost growth



What are Our Financing Assumptions?

1. Premium financing applied to working-age
   - Single premium charged to working-age to balance add'l Medicare outlays
   - Subsidized by Medicare and SNAP, for low income
   - Retirees continue paying current-law premiums for Medicare Parts B and D.
   - High payment-benefit linkage $\rightarrow$ low financing distortion (except for subsidized workers)
2. Payroll-tax financing
   - All enrollees pay Medicare premiums for Parts B and D.
   - HI taxes on earnings are set to cover add'l Medicare outlays.
   - No payment-benefit linkage $\rightarrow$ high financing distortion
3. Deficit financing
   - All enrollees pay Medicare premiums for Parts B and D.
   - Add'l Medicare outlays are financed through increases in debt.
   - No payment-benefit linkage, less investment $\rightarrow$ high financing distortion and less capital

The Effects on Health and Productivity in 2060

Financing Option	Uninsured	Population not Receiving Medical Treatment	Population in the Sickest Health States	Increase in Productivity
Current Law Baseline	27.1%	12.3%	14.5%	
Premium	0.0%	0.5%	13.3%	3.6%
Payroll	0.0%	0.7%	13.2%	7.2%
Deficit	0.0%	0.6%	13.3%	7.6%

Note: The effects of health on productivity are calculated as a percentage change from baseline.

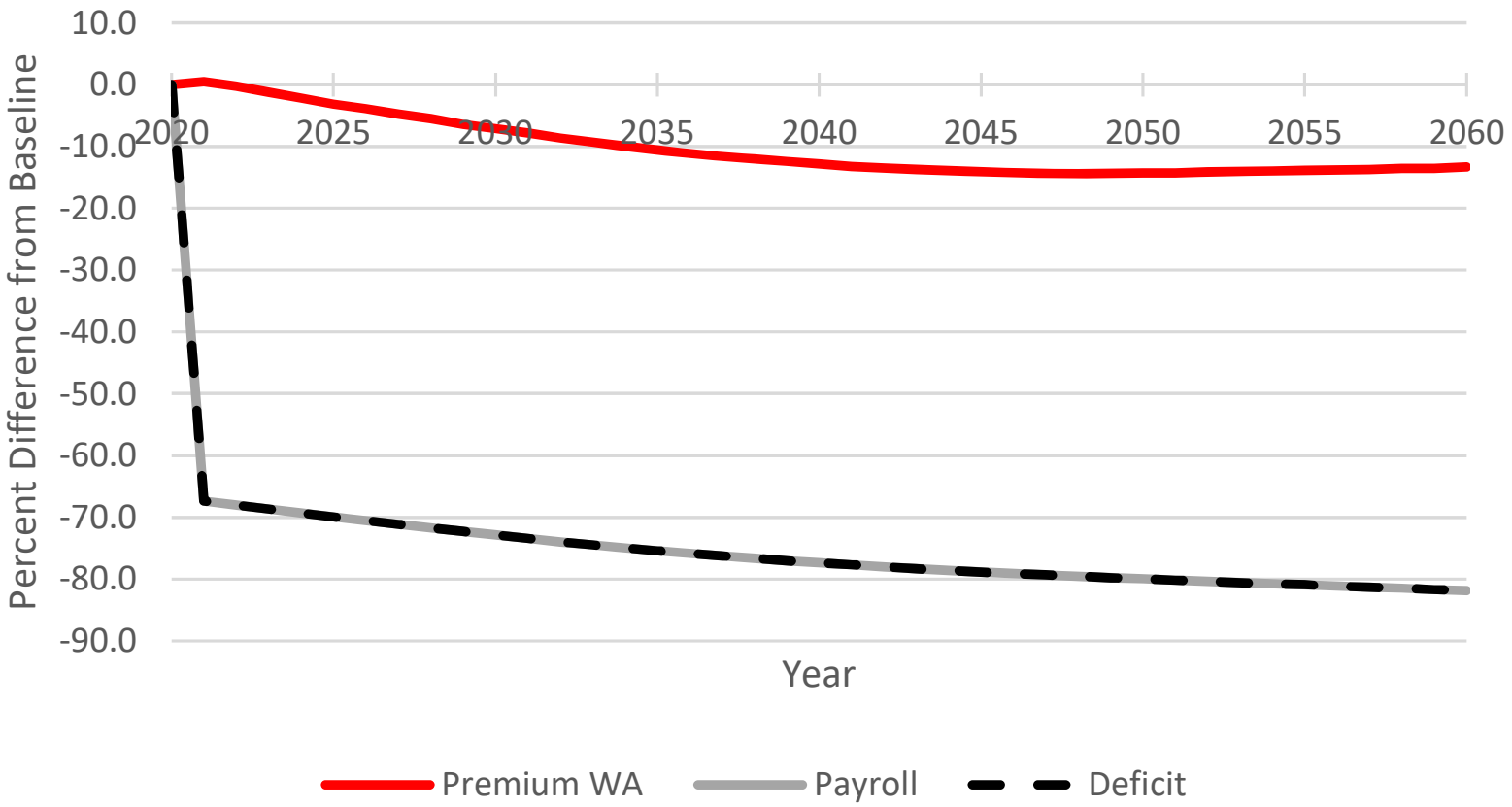
Summary: Results

Effects on Longevity and the Population in 2060

Financing Option	Change in Life Expectancy (years)	Change in Population Size (%)
Premium	1.8	2.9
Payroll	1.8	2.9
Deficit	1.8	2.9

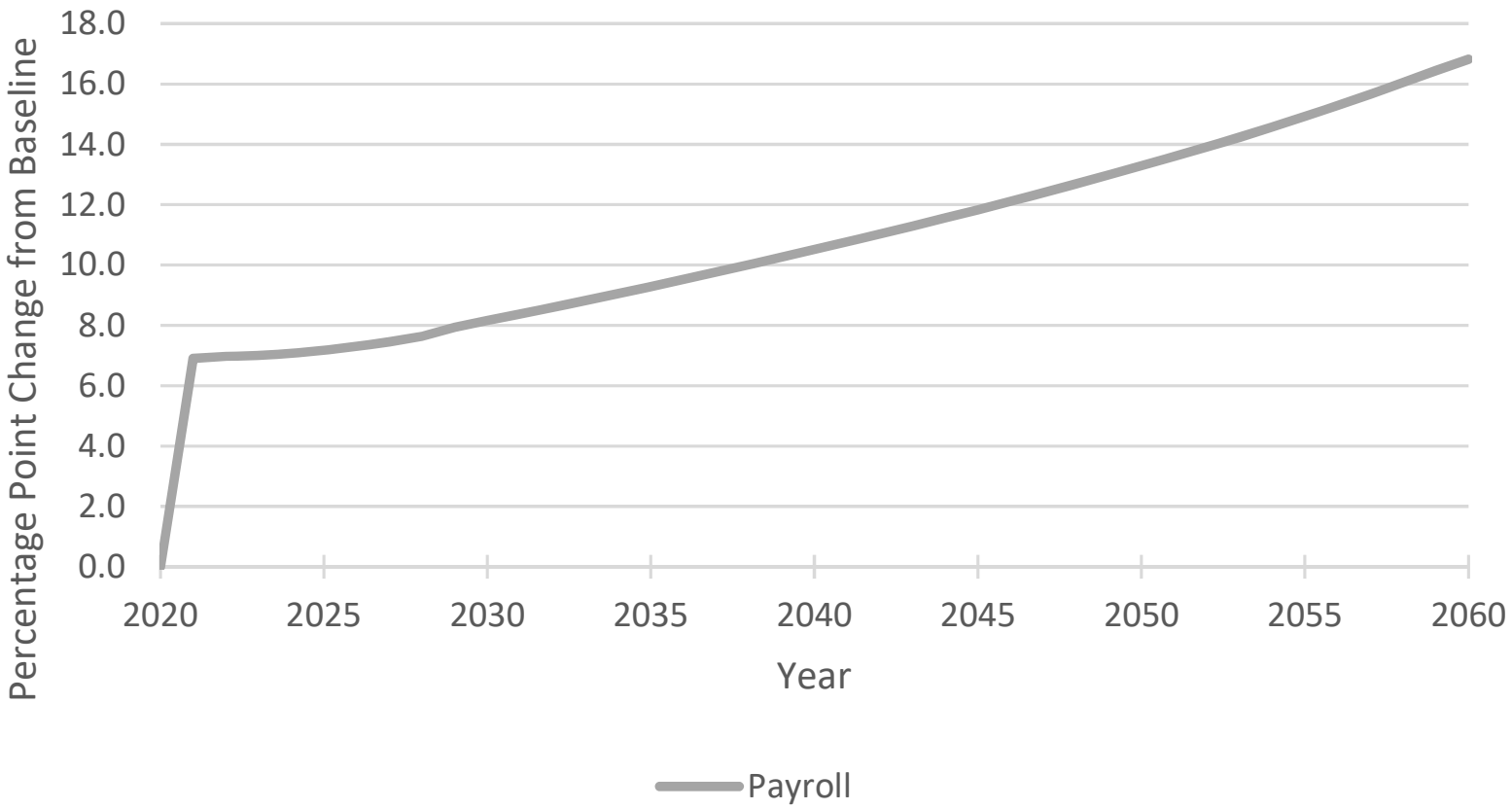
Summary: Results

Premiums



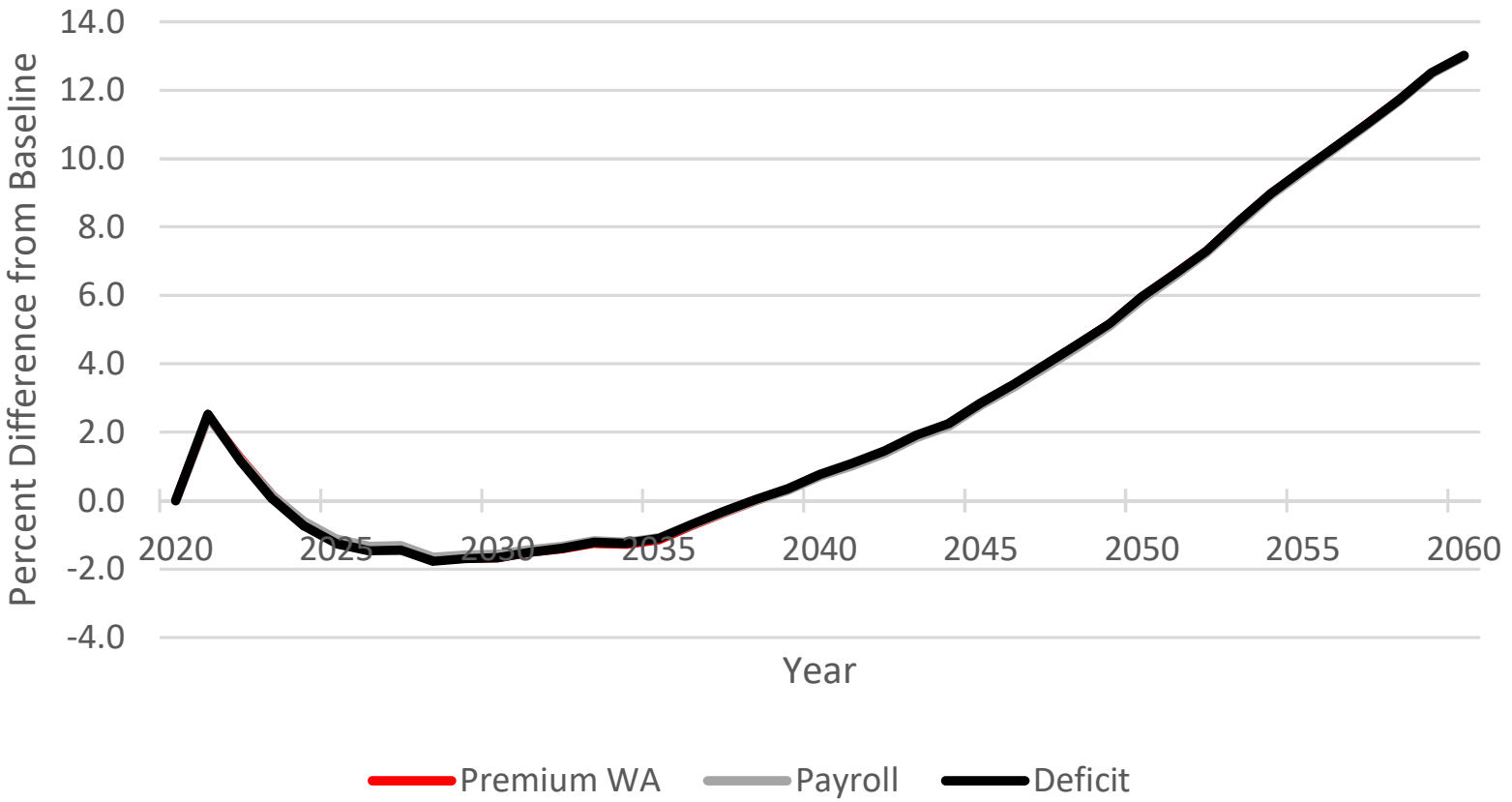
Summary: Results

Payroll Tax Rates



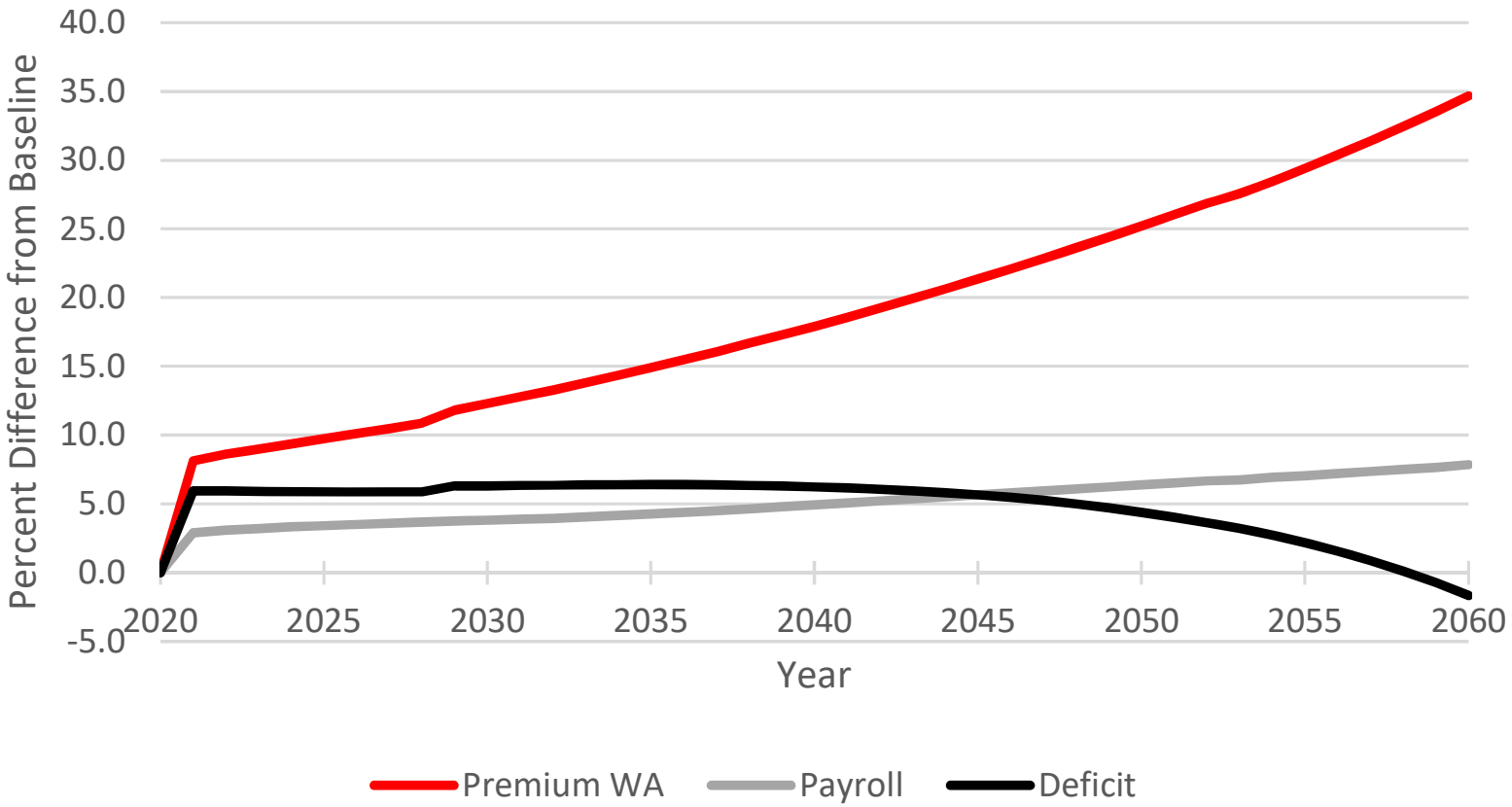
Summary: Results

Total health spending initially increases, decreases until 2038, and increases above current law? Why? Remember, under current law, uninsured almost triples over time, becoming costlier to insure.



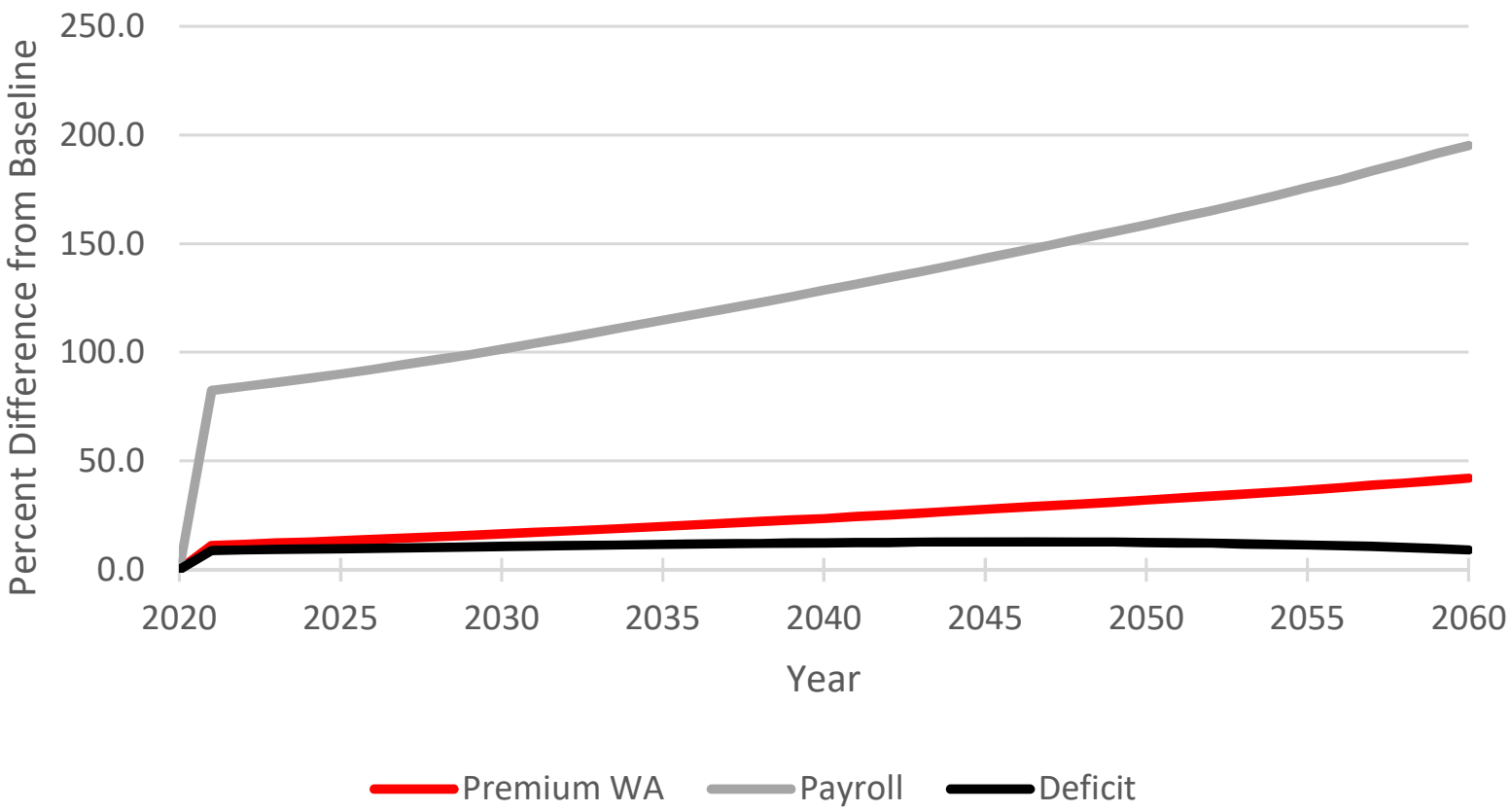
Summary: Results

Income tax revenue increases even with payroll tax financing that contracts economy (below). Why? Removing tax deductibility of employer-based health benefits expands the *taxable* base.



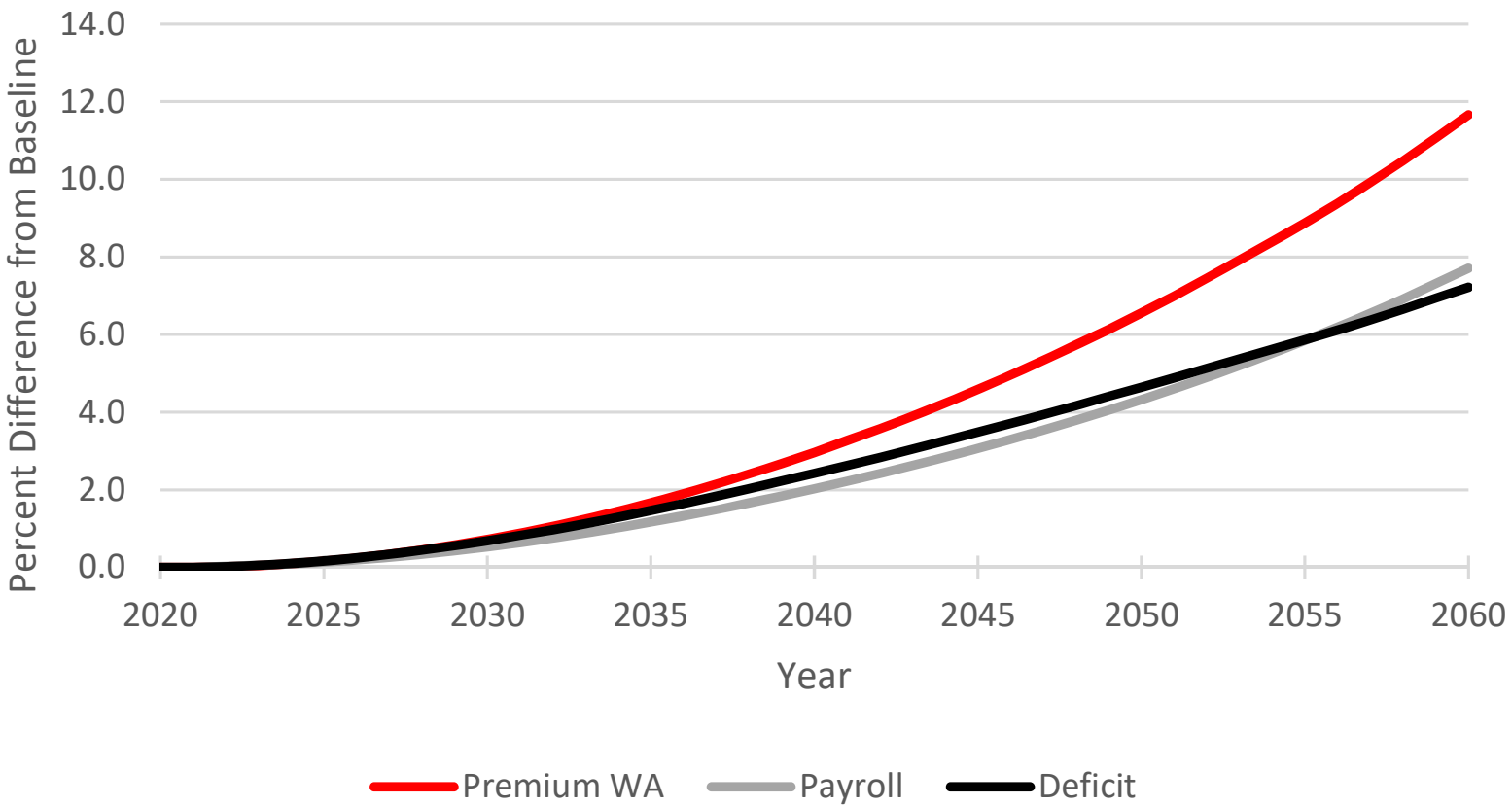
Summary: Results

Same with payroll tax revenues



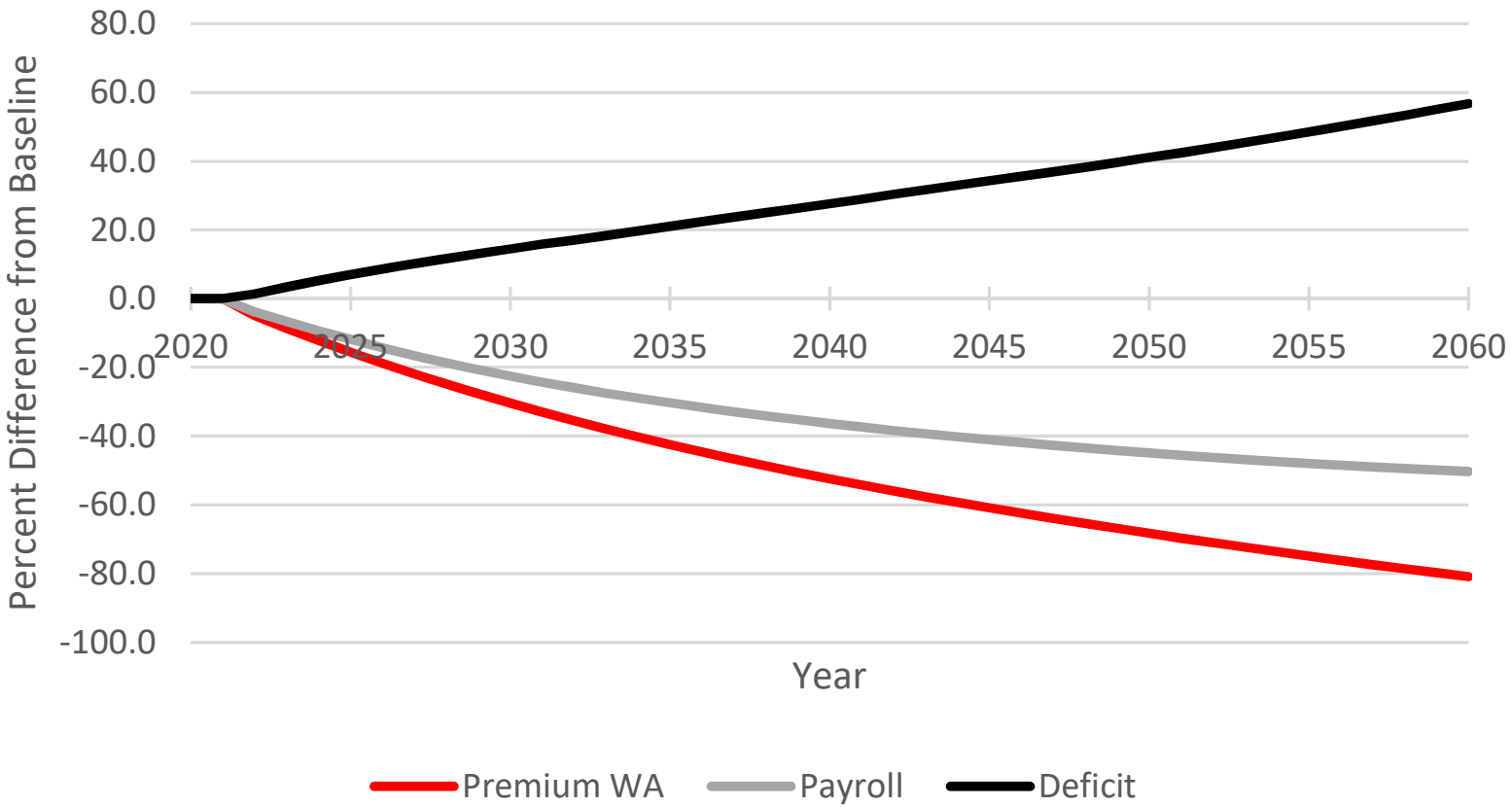
Summary: Results

Social Security (OASI) Spending increases, even w/ payroll tax and deficit financing that contracts economy (below). Why? Reclassification of compensation from employer-based benefits to covered wages.



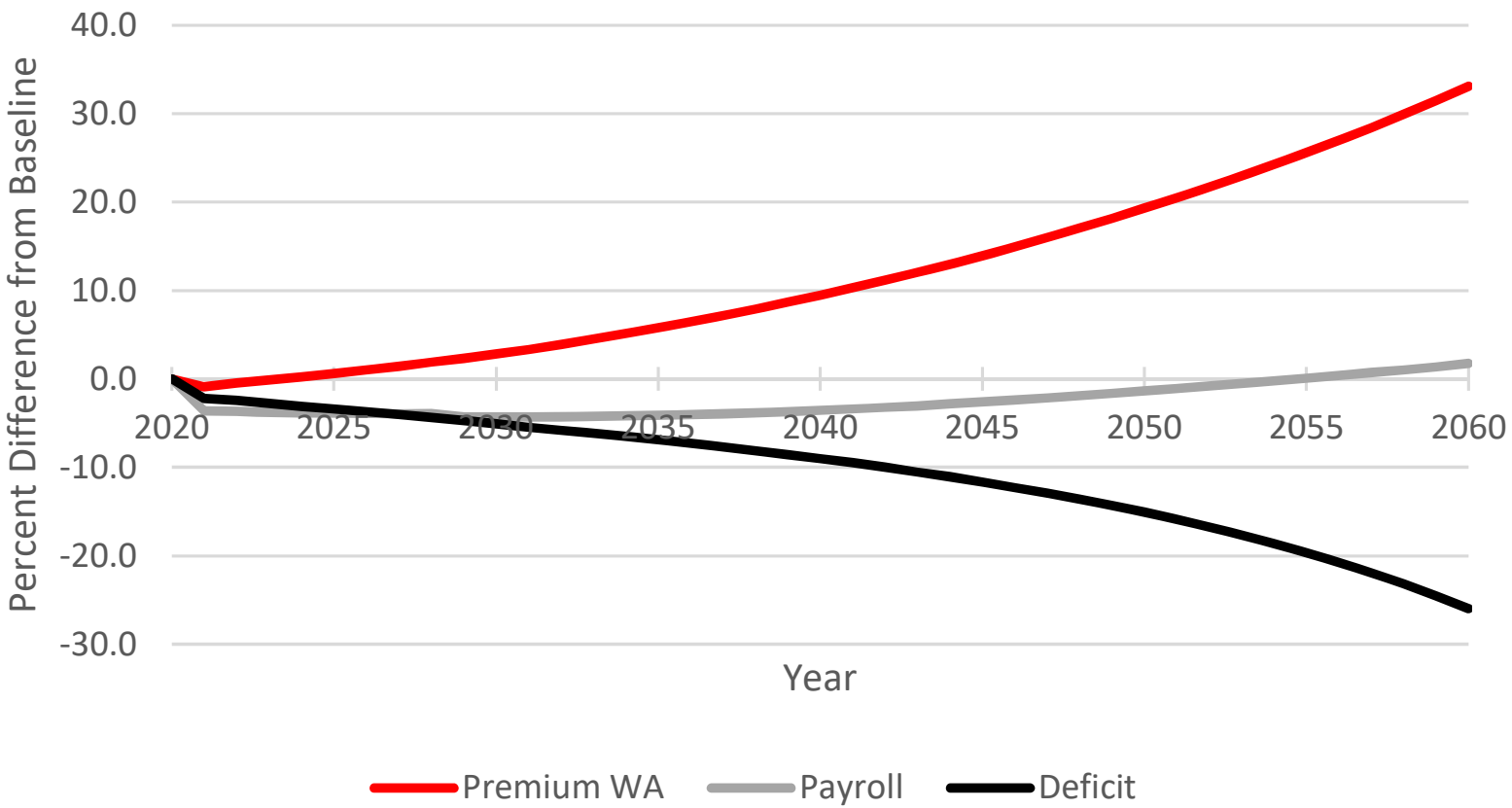
Summary: Results

Federal debt



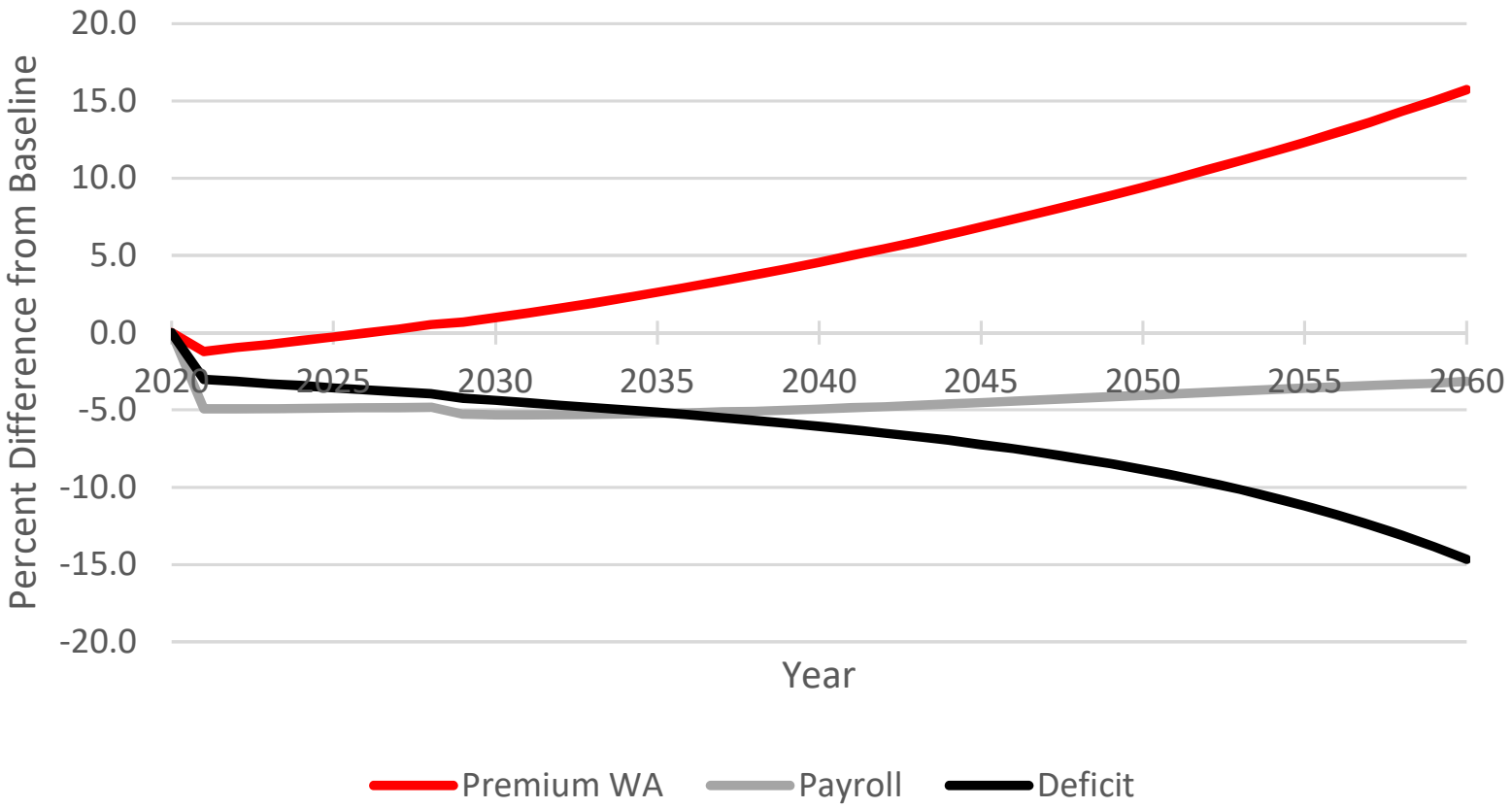
Summary: Results

Capital



Summary: Results

Output (GDP)



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Budget Model

Roadmap

Will stop formal presentation here. However, more specific details below.

1. Sketch of actual model
2. Parametrization and calibration
3. Detailed Results

Model overview: Introduction

Heterogeneous-agent OLG model.

- **Households**:
  - May live from age 21 to age 100
  - Uncertainty: future health state, expenses within each health state, future wages and mortality
  - Choices: labor (if any); purchase insurance (employer + individual); whether to pay out-of-pocket expenses; non-health consumption / savings
  - Productivity and health state interact: higher health =¿ more productive;
- A representative **firm** combines labor and capital inputs to produce output and offers group health insurance.
- The **government** collects taxes and runs Social Security, Medicare, and Medicaid programs

Model overview: The Role of Health

- Current period health affects:
  - Earnings ability
  - Total medical expenditures
  - Survival probability to next period
  - Next period's health
- Health insurance covers part of total medical expenditures
- Out-of-pocket (OOP) expenses depend on:
  - Insurance type
  - Total medical expenditures

Model overview: Private Health Insurance

- Households whose earnings are above a threshold are offered employer-provided health insurance. All face the same HI premium.
- HI premiums:
  - Average pooled expenditures + allowance for overhead and profits
  - EPHI is subsidized by the firm
  - EPHI is fully tax deductible
- Households who choose not to enroll in EPHI lose:
  - Firm subsidy
  - Tax deductibility

Model overview: Public Health Insurance

- Medicare:
  - All retirees enroll in Parts B and D.
  - Retirees pay income-dependent premiums for Parts B and D.
  - Working-age pay current-law HI tax.
  - Remainder of costs is deficit financed.

- Medicaid
  1. Two ways to qualify:
     - Categorically (low-income and poor).
     - Medically (very large medical expenses).
  2. 65% of costs paid by Federal Government, remainder paid for through state income taxes.

Model overview: Important Features

1. Working-age households that don't enroll in health insurance:
   - Do not pay health insurance premium
   - May pay all medical expenditures out-of-pocket

2. Those who could have enrolled in employer-provided group health insurance also:
   - Forego employer portion of insurance premium, $\lambda^{ins}\, p_t^{ins}$
   - Forego tax benefits of employer-provided health insurance

3. Households may decline medical treatment:
   - Do not incur out-of-pocket medical expenses
   - Have an increased probability of transitioning into bad health

Model: The Household Problem

$$V(\mathbf{s}, \mathbf{S}_t; \mathbf{\Omega_t}) = \max_{c,I,a',ins',\iota} \Big\{ u(c, I) + \tilde{\beta} \Big(s_{j,h} \; E\big[\, V(\mathbf{s}', \mathbf{S}_{t+1}; \mathbf{\Omega}_{t+1}) \,|\, \mathbf{s} \, \big] + (1 - s_{j,h}) \big(A(\mathbf{s}', \mathbf{S}_{t+1}; \mathbf{\Omega_{t+1}}) + \phi(a') \big) \Big) \Big\}$$

subject to

$$\begin{aligned} c + (1 + \mu)a' = (1 + r_t)a + & \; (w_t \, e_{j,h} \, n(j,h) - \lambda^{ins} \, p_t^{ins}) \\ & + tr_{SS,t}(b) + q_t(j) \\ & - \tau_{I,t}(\cdot) - \tau_{P,t}(\cdot) - \tau_{state,t}(\cdot) - \tau_{C,t} c \\ & - 1_{\{\iota=1\}} \, oop^{TOT}(m, ins) - (1 - \lambda^{ins}) p_t^{ins} \end{aligned}$$

OASI benefits, $tr_{SS,t}(b)$, depend on average historical taxable earnings up to the tax max, b. $n(j,h)$ is the labor supply of a household with a head of age j in health state h.

Model: Calculating Household Medical Expenses

$$\begin{aligned} m^{TOT}(j,h,d) &= m(j,h,d) \\ &+ (adults(j)-1)\, m(j,\bar{h},\bar{d}) \\ &+ children(j)\bar{m}_{Child} \end{aligned}$$

Where

- $m(j,h,d)$ are medical expenses of head of household at age j, health state h, and expenditure percentile d
- $m(j,\bar{h},\bar{d})$ are average medical expenditures at age j
- $\bar{m}_{Child}$ are average medical expenditures of children under the age of 18
- $adults(j)$ are the average number of adults per household when the head is of age j
- $children(j)$ are the average number of children under 18 per household when the head is of age j

Model: Calculating of Out-Of-Pocket Spending

$$\begin{aligned} oop^{TOT}(m, ins) &= oop^{Head\ of\ Household}(m, ins) \\ &+ (adults(j) - 1)\, oop^{Spouse}(m, ins) \\ &+ children(j)\, oop^{Child}(m, ins) \end{aligned}$$

$$oop(m, ins) = \gamma^{ins}(m) \times m(h, d),$$

where γ^{ins} is the cost sharing parameter and

$$ins = \begin{cases} 0, & \text{No insurance} \\ 1, & \text{Employer-provided health insurance} \\ 2, & \text{Private health insurance} \\ 3, & \text{Medicare} \\ 4, & \text{Medicaid.} \end{cases}$$

Calculating Health Insurance Premiums

Individual health insurance premiums equal the average pooled total medical expenses plus an amount for overhead:

$$p_t^{ins} = \frac{\sum_j \int_{A\times B\times E\times H\times D} m^{TOT}(j,h,d)dX_t(\mathbf{s})}{\sum_j \int_{A\times B\times E\times H\times D} dX_t(\mathbf{s})} \times \frac{1}{MLR^{ins}},$$

Model: Total Compensation and Benefits

$$\begin{aligned}
\text{Total Compensation} &= w_t\, e_{j,h}\, n(j,h) \\
\text{Health Insurance Benefits} &= \lambda^{ins}\, p^{ins} \\
\text{Cash Compensation} &= w_t\, e_{j,h}\, n(j,h) - \lambda^{ins}\, p^{ins} \\
\text{Taxable Compensation} &= w_t\, e_{j,h}\, n(j,h) - 1_{\{\lambda^{ins}=1\}} p^{ins}
\end{aligned}$$

Where $n(j,h) = (l^{max}\, adults(j) - l)$ and $\lambda^{ins} = 0 \quad \forall\ ins \neq 1$.

Model: Add'l Standard Components of Model

- Household Preferences See Appendix
- Representative Firm See Appendix
- Government Revenues See Appendix
- Government Outlays See Appendix
- Government Surplus See Appendix

Calibration and Parameter Choices

Model Parameters: Overview

There are lots of parameters in the model that we need to choose. The goal is to choose parameters that generate model results that are roughly consistent with the economy.

Most parameters are fairly standard, so we will focus on those parameters that are related to health.

- Medical expenditures, OOP payments, Medicare premiums;
- Health and survival transition probabilities;
- Wage effects;
- Medical loss ratio;
- Excess cost growth.

Estimation and Data Sources

Health Expenditures and Out-of-pocket payment functions:

- MEPS

Health Transition Probabilities:

- MEPS for people < 55 years old
- HRS for people ≥ 55 years old

Wage Process:

- PSID
- Literature

Aggregate Health Spending:

- NHEA data adjusted to make it consistent with MEPS and model components.

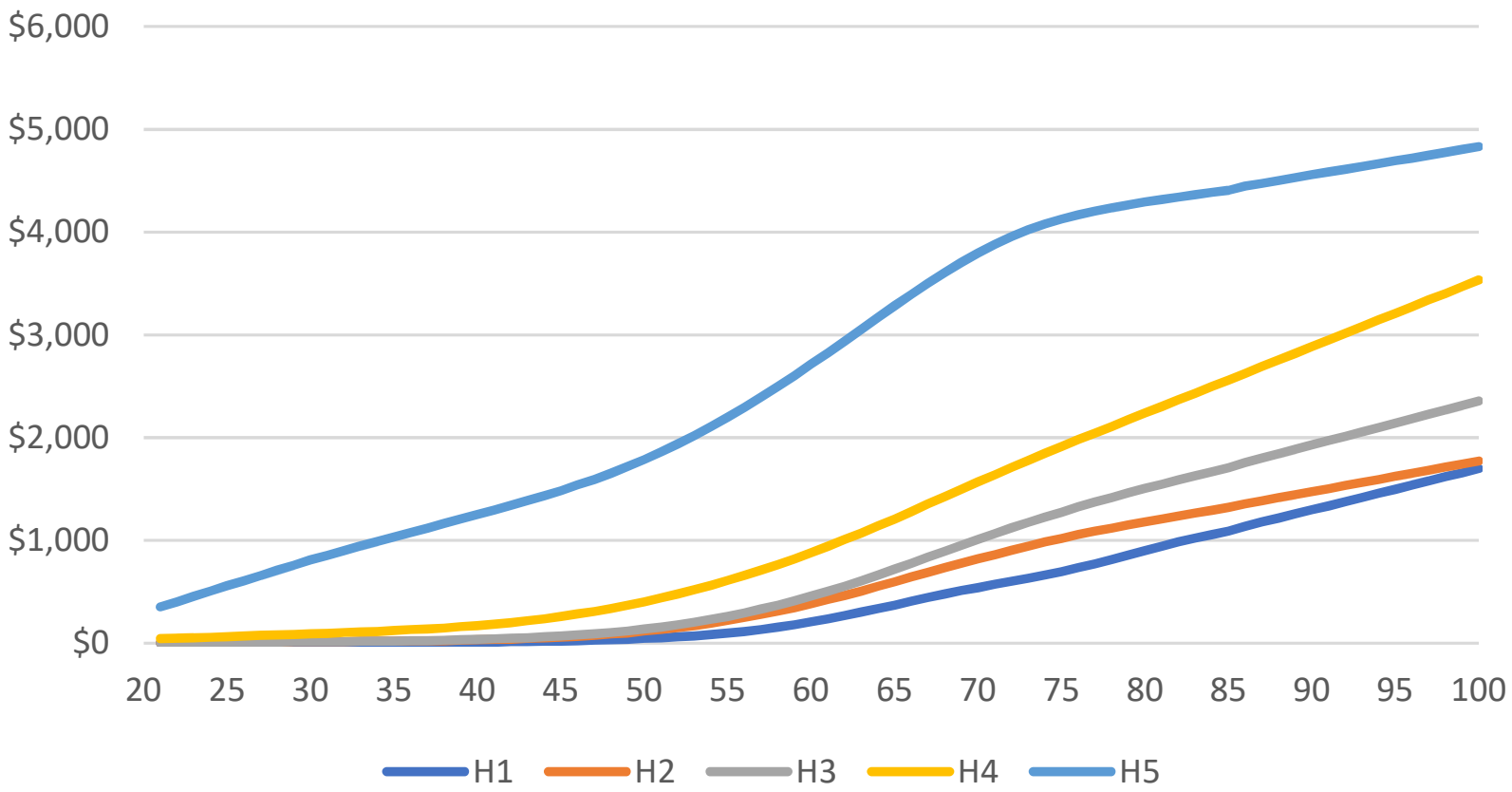
The Medical Expense Distribution

We track three moments of the medical expense distribution for each age and health state:

1. $d = 1$: bottom of the distribution, from 0 to the 40^{th} percentile;
2. $d = 2$: middle of the distribution, from the 41^{st} to the 90^{th} percentile; and
3. $d = 3$: top of the distribution, from the 91^{st} percentile to the maximum.

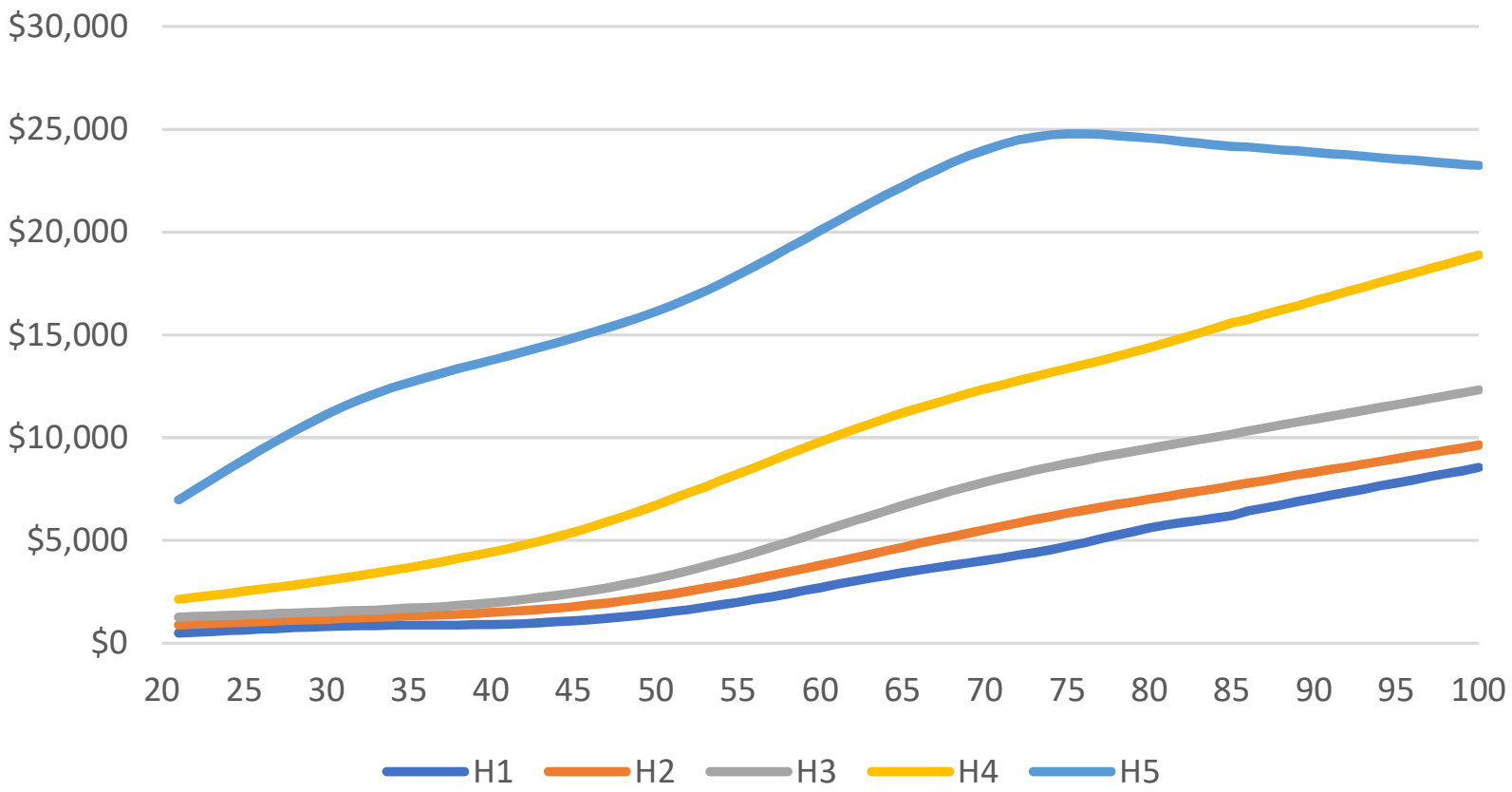
Estimating Total Medical Expenditures, d=1

By Age and Health State, 0 to 40th Percentile of Distribution



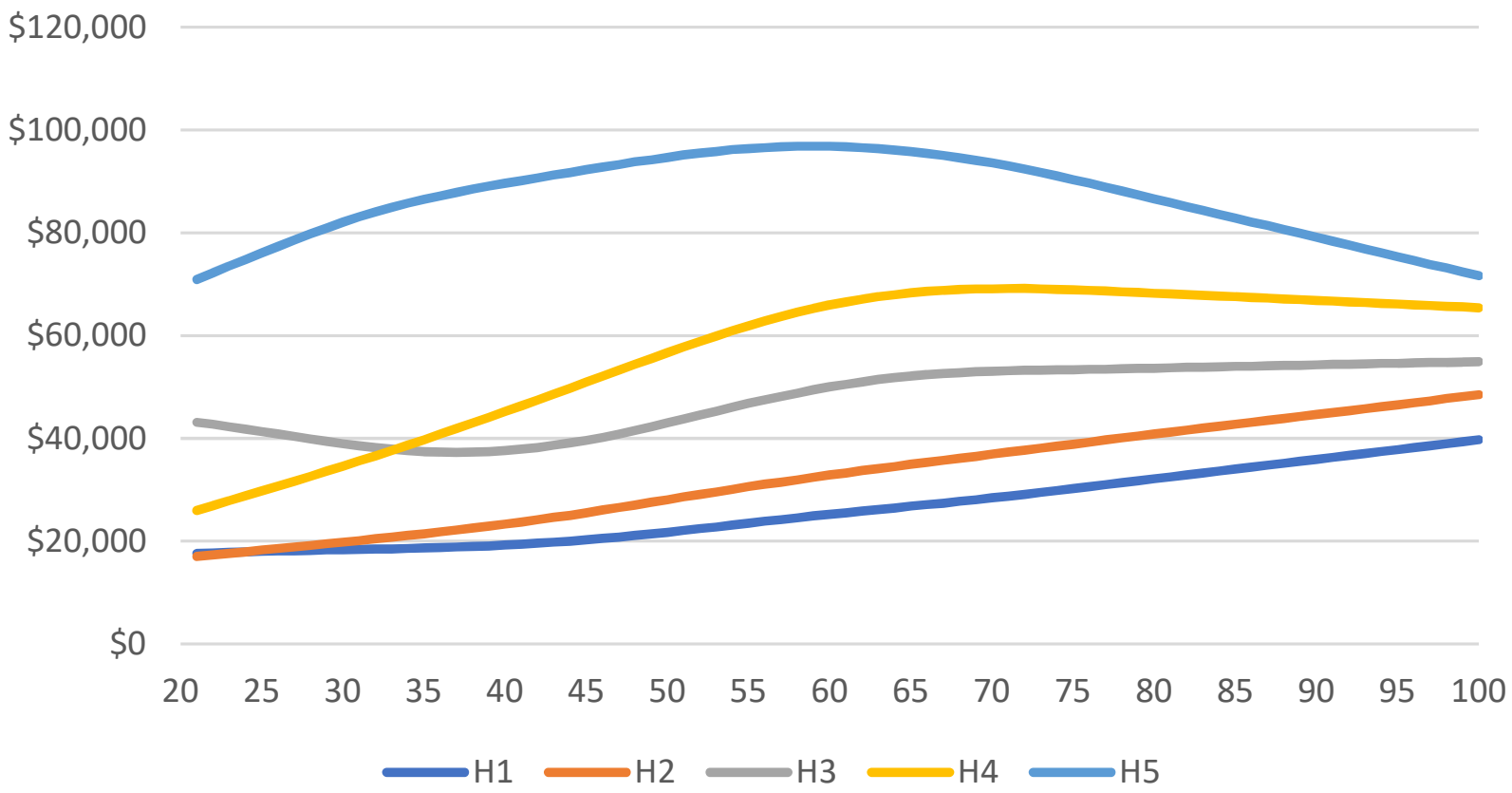
Estimating Total Medical Expenditures, d=2

By Age and Health State, 41st to 90th Percentile of Distribution



Estimating Total Medical Expenditures, d=3

By Age and Health State, 91st to 100th Percentile of Distribution



Estimating the Insurance Functions

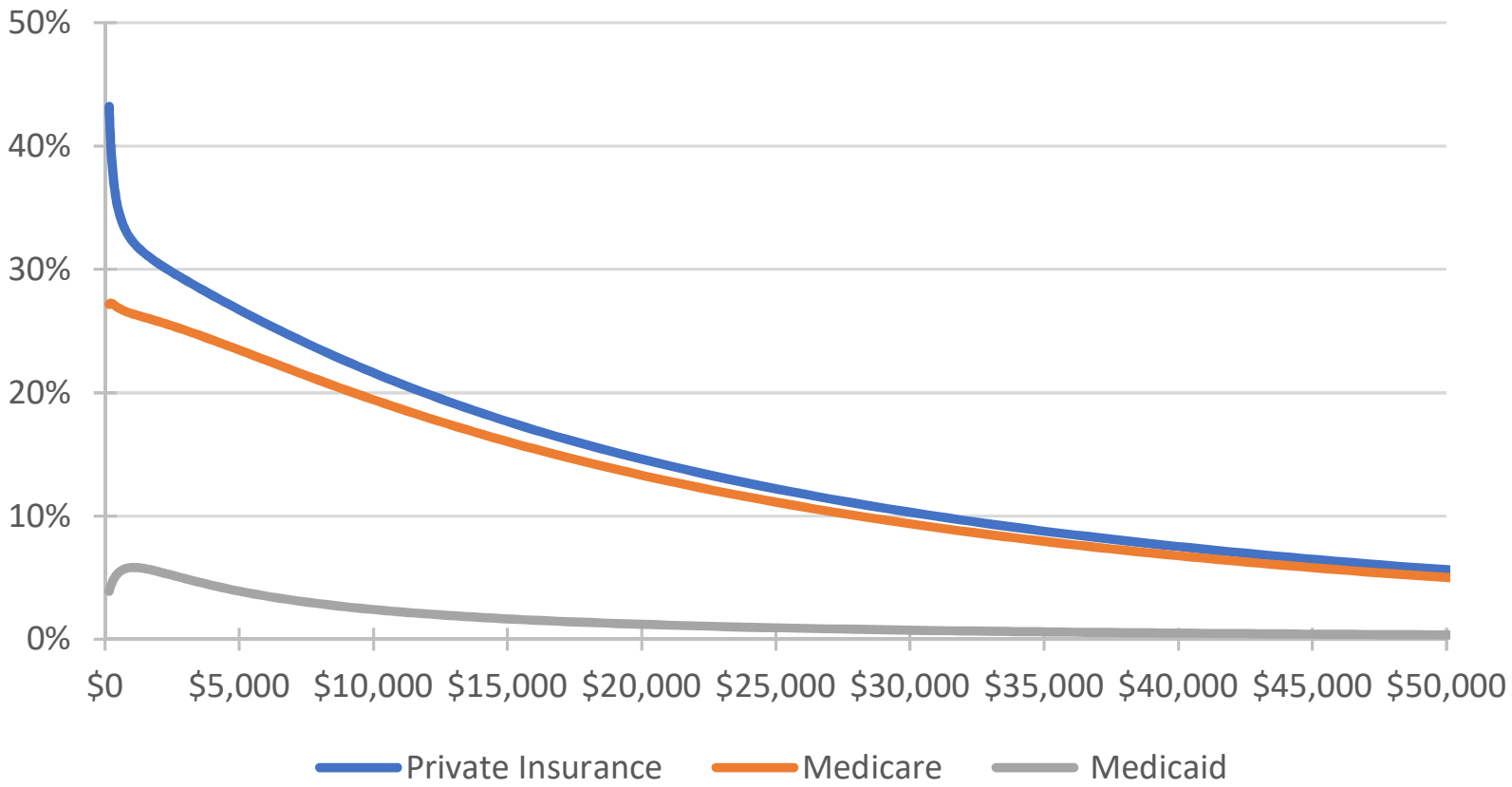
We need to know how much of total medical expenditures are covered by insurance versus paid as out-of-pocket.

We estimate those reimbursement functions from MEPS data using only people who had reimbursements by one of the following insurances:

- Private Insurance
- Medicare
- Medicaid

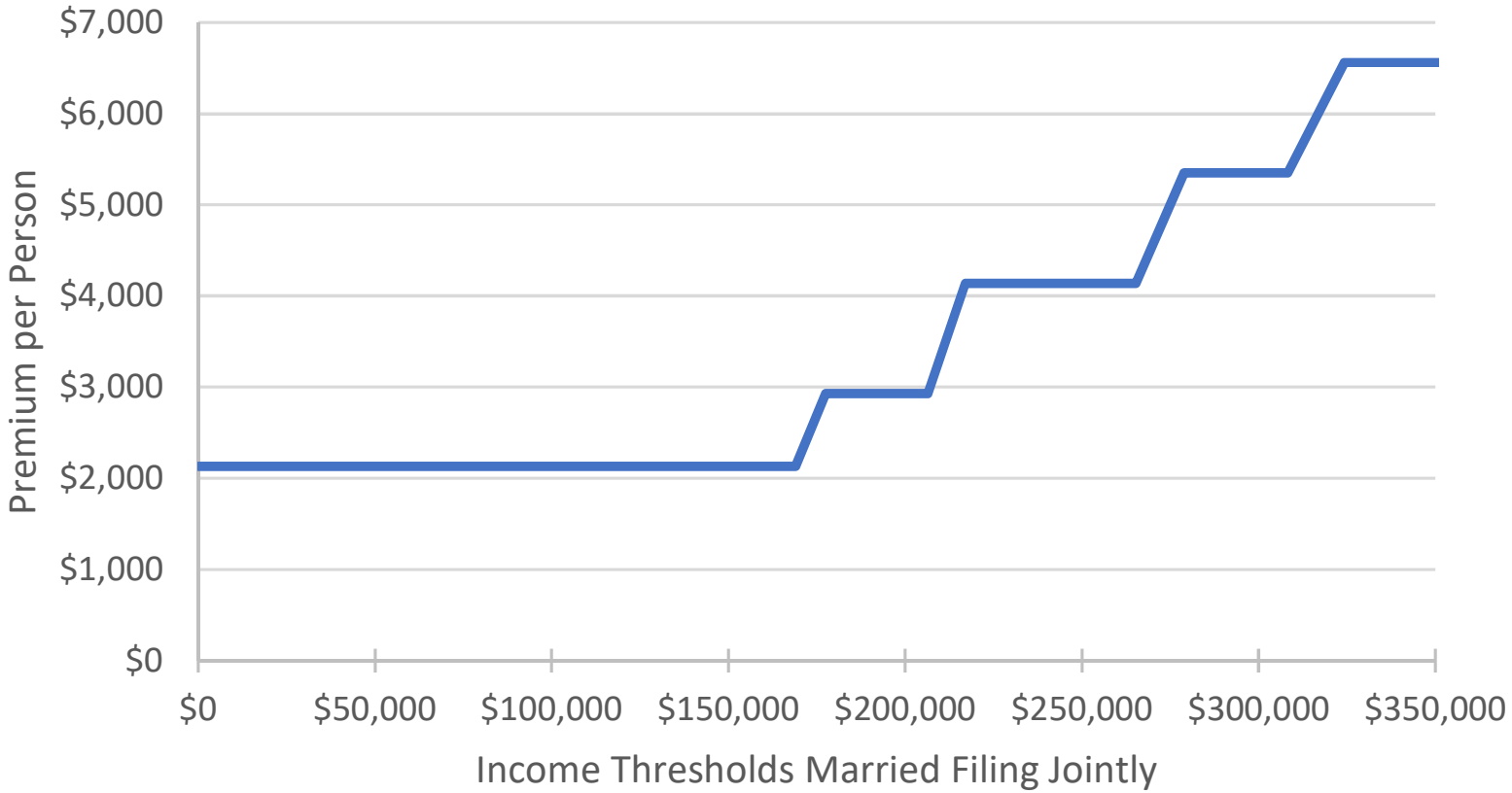
Estimating Insurance Policy Functions

Estimates of $\gamma^{ins}(m)$, the share of total medical expenses paid out of pocket.



Source: MEPS.

Medicare Part B and D Premiums



Note: Amounts are per person. Income threshold is for married filing jointly.
Source: Medicare.gov.

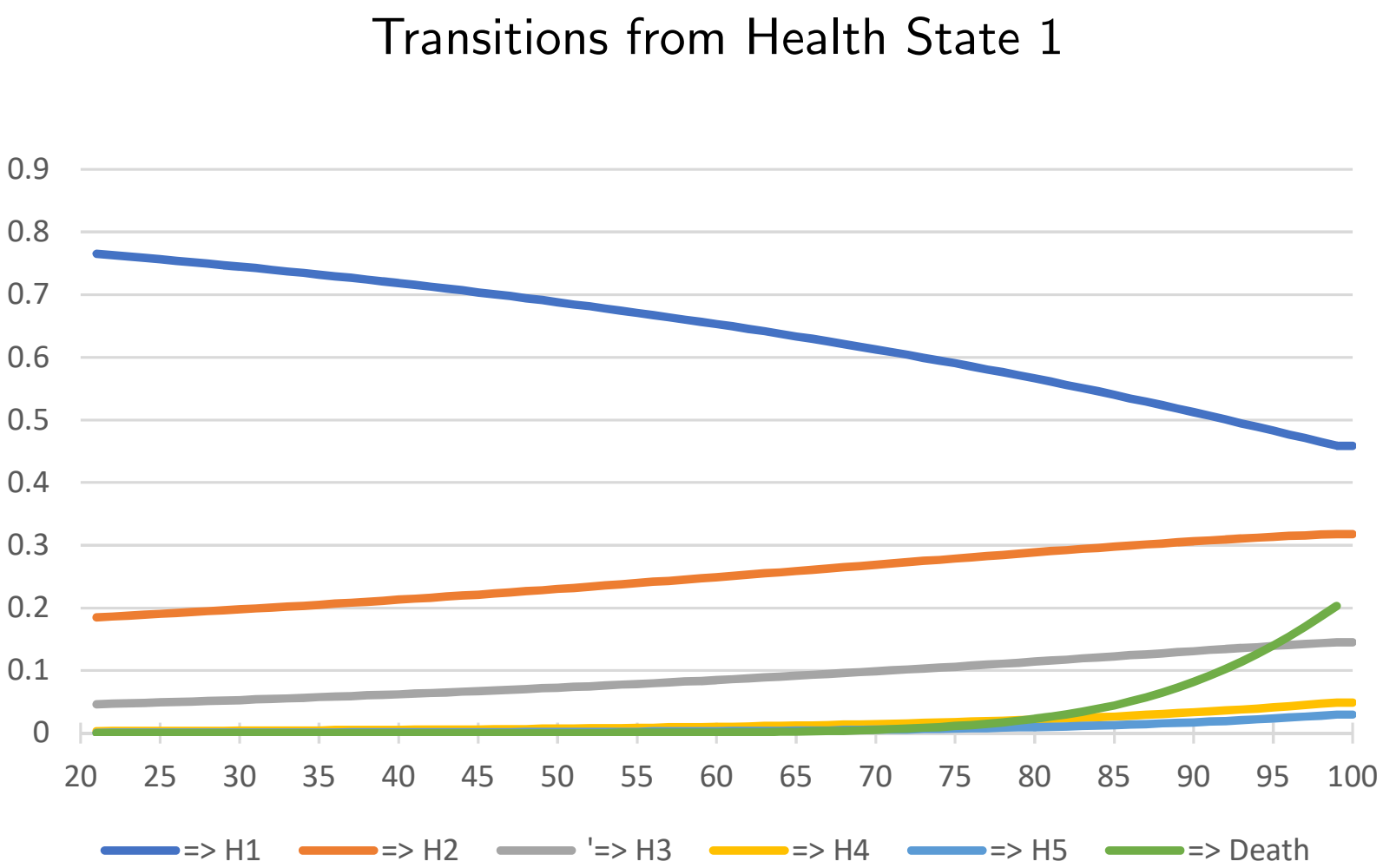
Health Transition Probabilities

Health transition probabilities differ depending on:

1. Age
2. Current health state; and
3. Whether household pays for medical care

- If health investments are made, households follow the transition probabilities, $\hat{P}[h'|h, j]$, we estimate from MEPS and HRS data.
- For those who decline medical care, we need to construct health transition probabilities because we do not observe them in the data.

Health Transitions for those who pay for care



▸ More

If Care is Refused

If care is refused, we construct the health transition probabilities based on

1. The transition probabilities $\hat{P}[h'|h,j]$ estimated from data
2. The amount of medical expenses that are avoided, $m(j,h,d)$

The new transition probabilities are given by

$$P[h'|h,j,m] = \frac{\omega(h,h',j,m)\hat{P}[h'|h,j]}{\sum_{h'}\left(\omega(h,h',m)\hat{P}[h'|h,j]\right)}$$

where the weights are calculated as

$$\omega(h,h',j,m) = \gamma(h,h')^{\delta(h)\frac{m(j,h,d)}{m(j,h,1)}}, \quad \forall\ h,h' \in \{1,...,5\}$$

Algorithm to Estimate γ and δ

1. Set $\delta(h) = 5 \ \ \forall \ h \in \{1, ..., 5\}$, choice is not consequential.
2. Assume that no health investment will lead to worse, not better health: $\gamma(h, h'') \geq \gamma(h, h') \ \ \forall \ h'' > h'$
3. Choose $\gamma(h, h')$ for each health state h separately to minimize the sum of square residual $\sum(P[h'|h, j, d = 1] - P^{ins=0}[h'|h, j])^2$, where $P^{ins=0}[h'|h, j]$ are the health transition probabilities of the uninsured. Assumption is that if you are in the lowest expenditure percentile ($d = 1$) and don't pay for care, you should face the same transition probabilities as the uninsured.
4. With γ in hand, set $\delta(h)$ to match, for each health state, the ratio of average total medical expenses of the uninsured to those of the insured that we estimate from MEPS data.
5. Assume that those in H5 stay in H5, those in H4 with worst expenditure shock transition to H5.

Parameter Estimates

Parameter Choices for γ

	H1	H2	H3	H4	H5
H1	0.7551	0.7643	0.8203	0.9207	0.9207
H2	0.9420	0.9420	0.9808	1.0226	1.0226
H3	0.9397	0.9397	0.9777	1.0003	1.0482
H4	0.9751	0.9751	0.9902	0.9990	0.9990
H5	0.0000	0.0000	0.0000	0.0000	1.0000

Parameter Choices for δ

H1	H2	H3	H4	H5
2.8930	5.0245	3.5619	0.6033	1.0000

Average Health Transitions If Care Was Refused

To:	H1	H2	H3	H4	H5
			From H1		
d=1	61%	25%	11%	3%	1%
d=2	54%	22%	12%	8%	4%
d=3	23%	10%	14%	38%	15%
			From H2		
d=1	11%	60%	23%	4%	1%
d=2	10%	52%	26%	9%	3%
d=3	4%	18%	29%	38%	11%

Note: The table shows the unweighted average health transition probabilities for the entire population.

Average Health Transitions If Care Was Refused

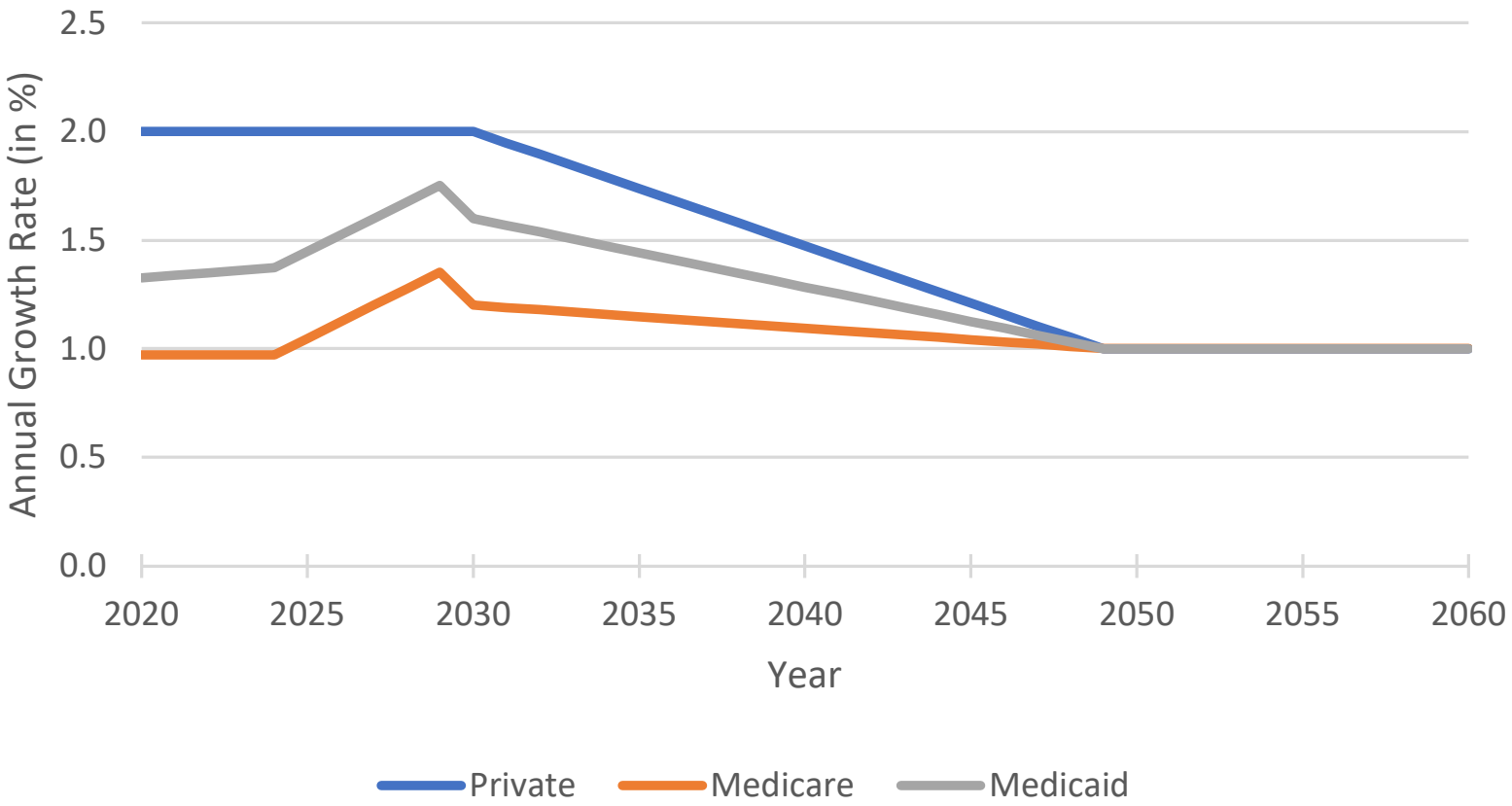
To:	H1	H2	H3	H4	H5
			From H3		
d=1	3%	18%	63%	14%	2%
d=2	3%	15%	62%	16%	3%
d=3	1%	4%	47%	20%	28%
			From H4		
d=1	2%	4%	26%	59%	10%
d=2	1%	4%	25%	59%	10%
d=3	0%	0%	0%	0%	100%

Note: The table shows the unweighted average health transition probabilities for the entire population.

Medical Loss Ratio by Insurer

Insurer	Medical Loss Ratio
Private Insurance	85.0%
Medicare	91.0%
Medicaid	93.0%

Projected Excess Cost Growth



Source: 2018 Long-Term Budget Outlook, Congressional Budget Office.

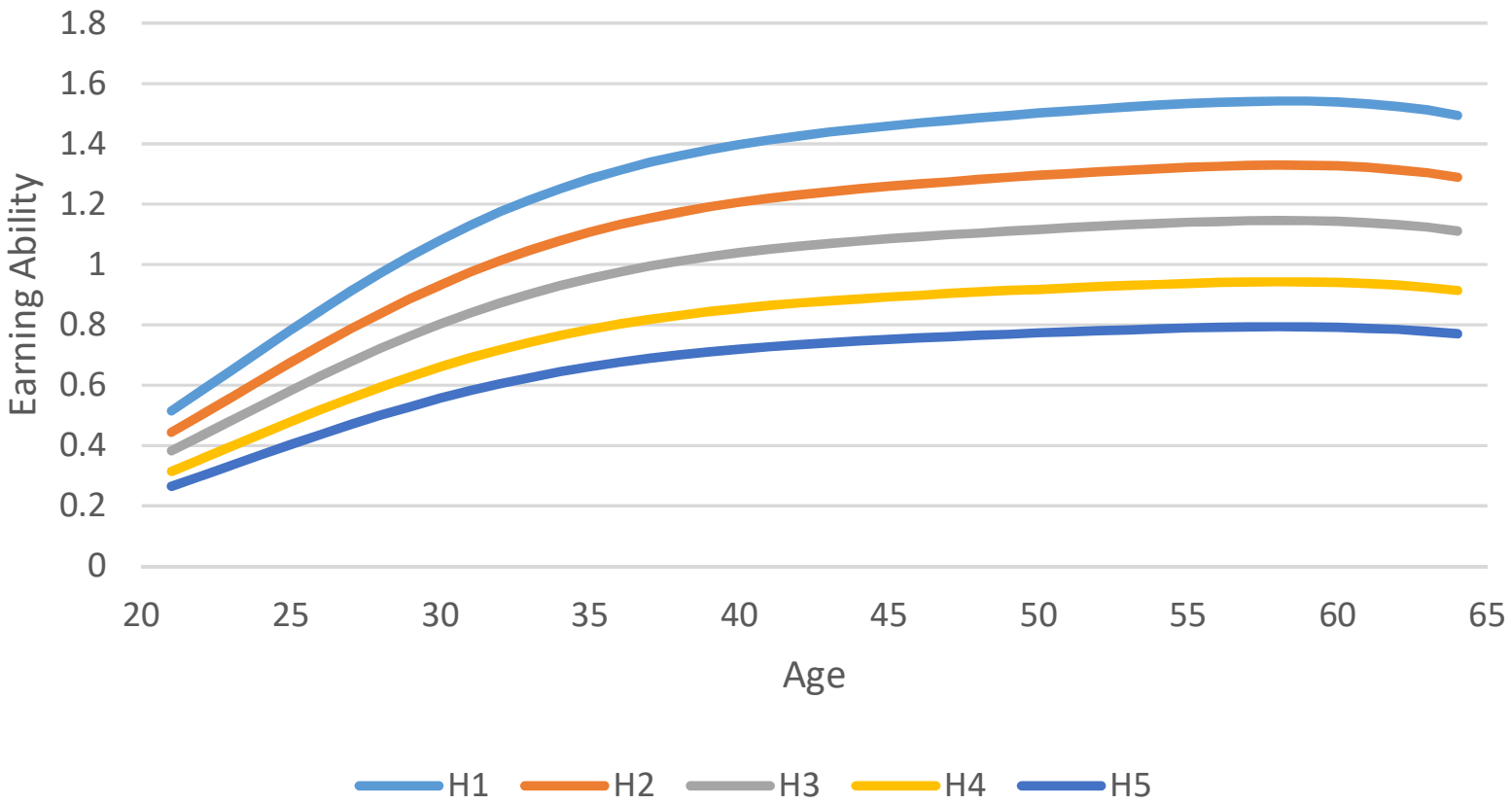
Health Spending: MEPS-NHEA Reconciliation

	2017 National Health Expenditure Accounts	18.0%
-	Research	0.3%
-	Total Structures and Equipment	0.6%
-	State and Local Administration Expenditures	0.1%
-	Federal Administration Expenditures	0.2%
-	Net Cost of Health Insurance Expenditures	1.2%
-	Public Health Activity	0.5%
-	Adjusting the Scope of Included Populations	2.3%
-	Adjusting for Patient Care Services Not Included in MEPS	1.2%
-	Adjusting for Expenditures not Tied to Specific Patient Events	1.0%
+	Prescription Drug Rebates	0.1%
-	Miscellaneous Adjustments	2.3%
	Model-consistent health expenses	8.6%

Source: Bernard et al. (2012), National Health Expenditure Accounts.

Earnings: Wages by Age and Health State

- Estimate log wages from PSID.
- Persistence $\rho = 0.95$
- Standard deviation of log wage shocks $\sigma = 0.22$



Calibration: Macro Targets

	Data/Target	Model	Parameter	Value	Interpretation
Old-age dependency ratio, U.S. Census	0.263	0.263	ν	0.0128	Population growth rate
Frisch elasticity of labor supply	0.50	0.50	α	0.4983	Share parameter of consumption
Capital/Output ratio	3.00	3.00	β $\tilde{\beta}$	1.0191 1.0012	Discount factor Growth-adjusted discount factor
Efficiency wage w	1.00	1.00	A	0.8474	Total factor productivity
Return to capital	0.050	0.050	δ	0.1000	Depreciation rate of capital stock
Average household earnings	\$61,037	\$61,019		92.4382	Scale adjustment parameter

Calibration: Health Targets

	Data/Target	Model	Value	Interpretation
Total health expenditure to GDP Ratio	8.60%	8.65%	1.1266	Scale factor for health expenditures
Fraction without health insurance, age 26-64	11.5%	11.8%	$13,081	Insurance cut-off earnings
Fraction in Medicaid, age 26-64	14.1%	13.6%	$12,000	Maximum Medicaid Assets

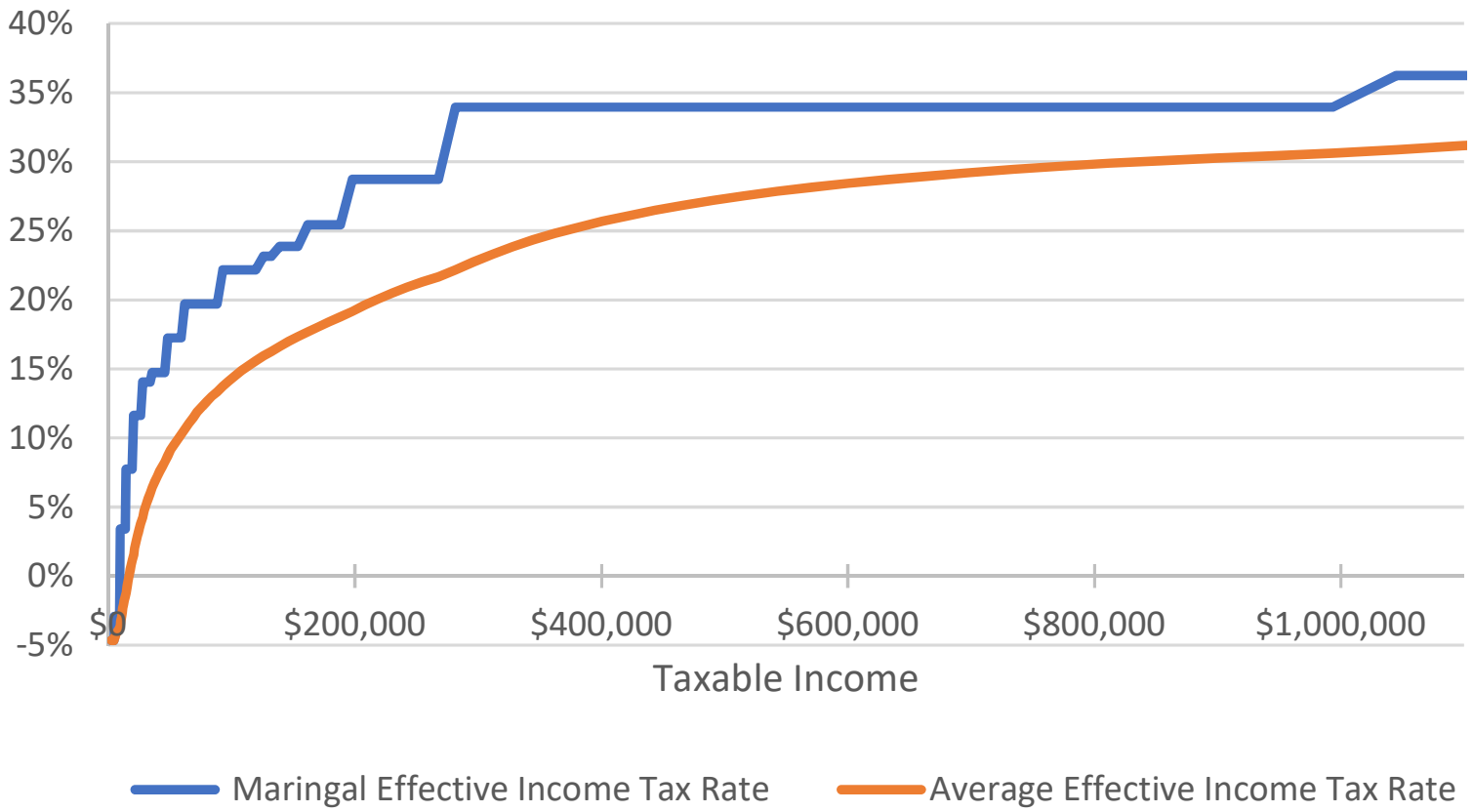
Demographics, Preferences and Technology

Parameter		Value	Comment
Demographics			
Maximum age	J^{max}	100	
Minimum age to receive OASI benefits	J_R	65	Full retirement age for OASI benefits
Minimum age to receive Medicare benefits	J_{HI}	65	Medicare eligibility age
Productivity growth rate	μ	0.0180	Growth of real GDP per capita in 1981-2013
Population growth rate	ν	0.0129	Target: Old age dependency ratio of 26.3%
Conditional survival rates			Estimated from MEPS and HRS data
Prefrences			
Coefficient of relative risk aversion	γ	3.0	Commonly used in the literature
Consumption share parameter	α	0.4983	Target: Frisch elasticity = 0.500
Maximum working hours		1.1209	Target: average work hours = 1.0
Discount factor	β	1.0191	Target: K/Y = 3.0
Growth-adjusted discount factor	$\tilde{\beta}$	1.0012	$\tilde{\beta} = \beta(1+\mu)^{\alpha(1-\gamma)}$
Production technology, wage process			
Share parameter of capital stock	θ	0.4500	PWBM estimate
Depreciation rate of capital stock	δ	0.10	Target: r = 0.05
Total factor productivity	A	0.8474	Target: w = 1.0
Autocorrelation parameter of log wages	ρ	0.95	
Standard deviation of log wage shocks	σ	0.26	

Taxes and Social Security System

Parameters		Value	Comment
Model units			
Taxable labor income ratio	η	0.8964	Target: $T_P / GDP = 6.01\%$
Scale adjustment		92.4382	Average earnings of \$61,037 in 2017
Income taxes			
Labor income tax schedule			PWBM projection
Capital income tax rate	τ_K	0.15	
Social Security system			
Social Security payroll tax rate	τ_p	0.124	
Medicare pay roll tax rate: HI	τ_{HI}	0.029	Current-law tax rates
: HI surtax	τ_{HI2}	0.009	
Maximum taxable earnings	$\vartheta_{\max}$	1.9447	1.4 x \$128,400 = \$179,760 in 2018
HI surtax threshold	ϑ_{HI}	2.4904	0.4 x \$200,000 + 0.6 x \$250,000
OASI benefit adjustment factor	$\psi_{O,t}$	1.1675	OASI spending/GDP consistent with PWBM data
Replacement rate thresholds: 0.90 - 0.32	ϑ_1	0.1627	1.4 x \$895 x 12 = \$15,036
: 0.32 - 0.15	ϑ_2	0.9809	1.4 x \$5,397 x 12 = \$90,670

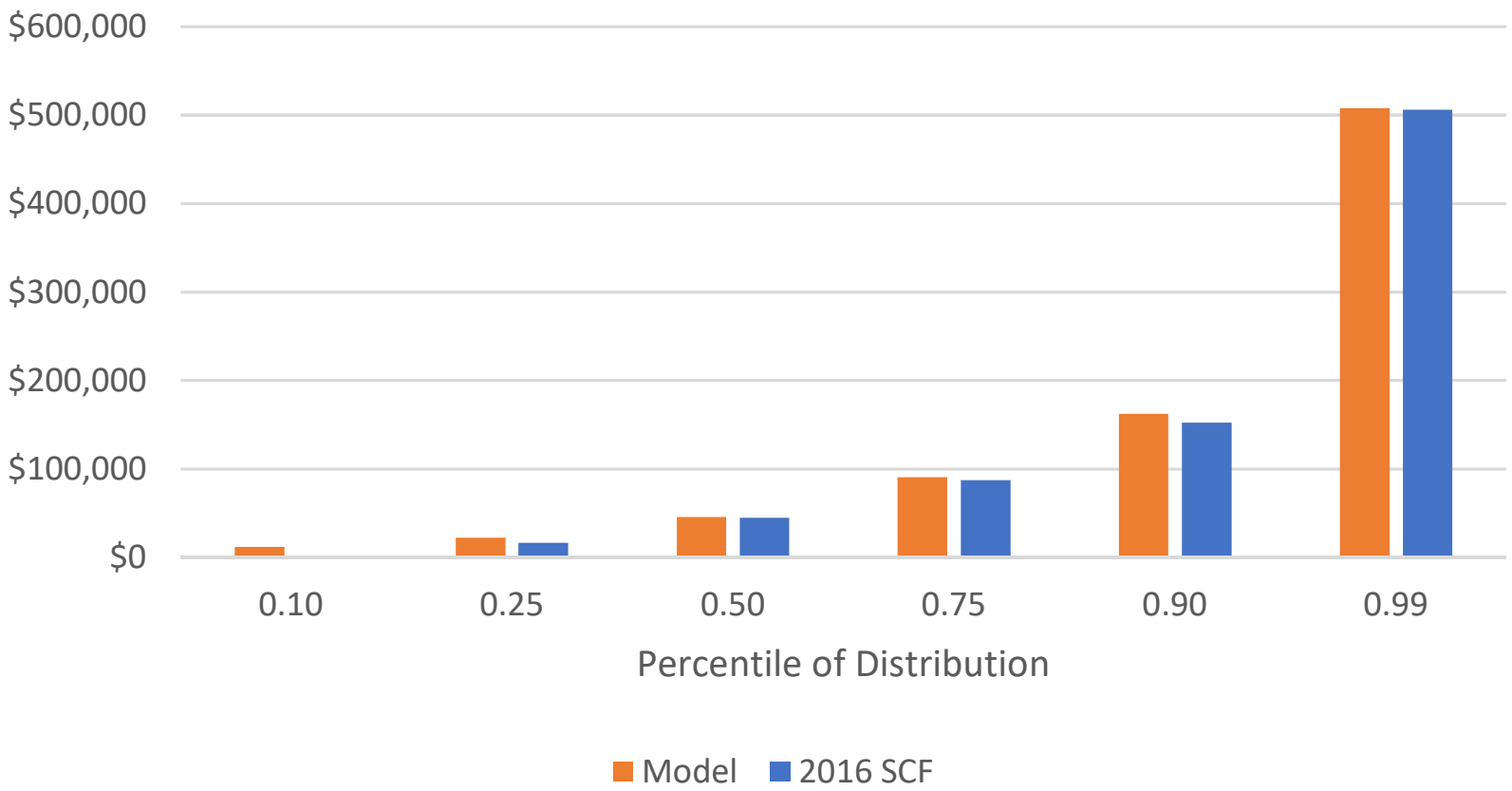
Effective Income Tax Schedule



Source: Penn Wharton Budget Model.

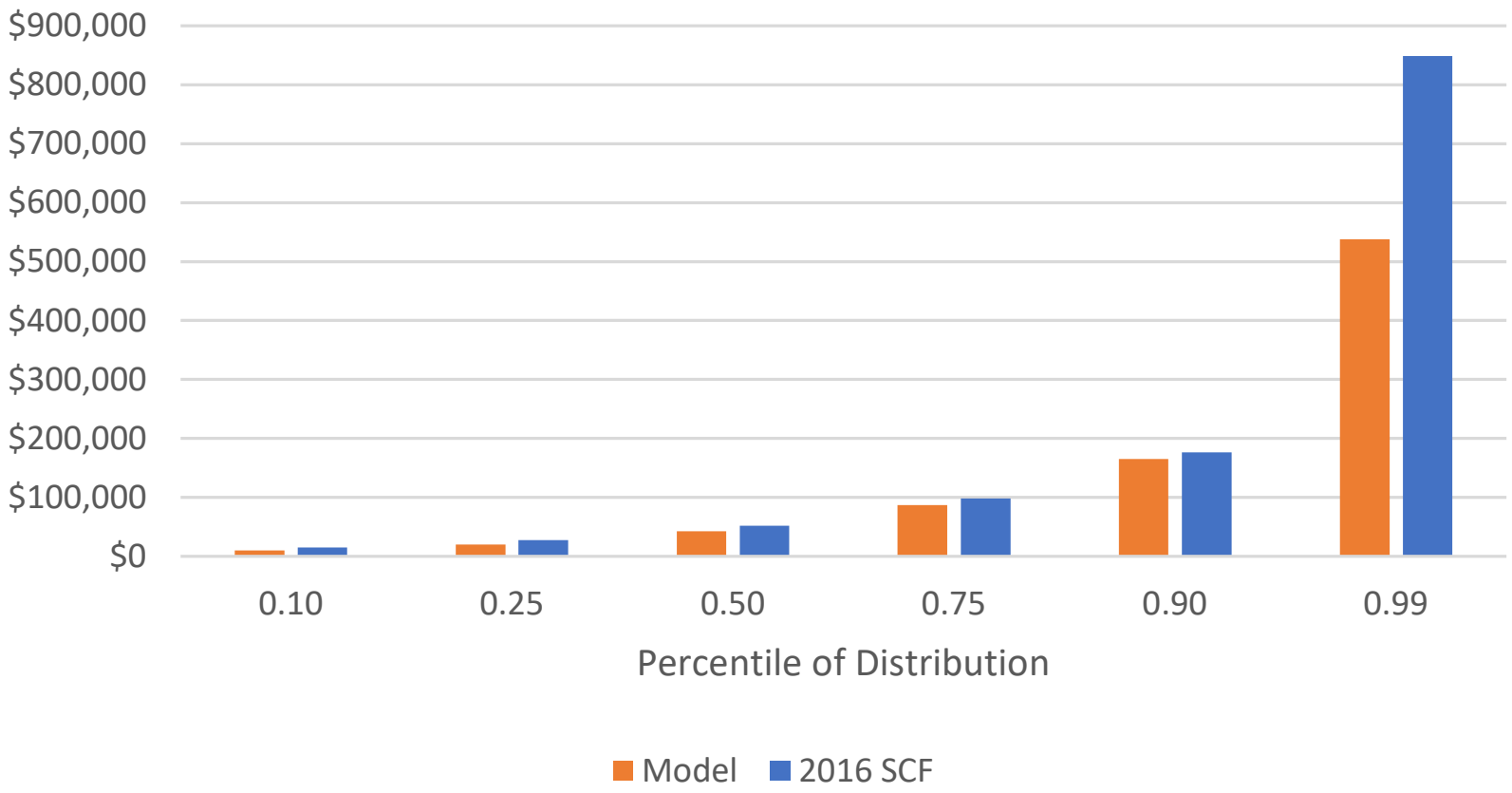
Calibration Results

Calibration Results: Earnings Distribution



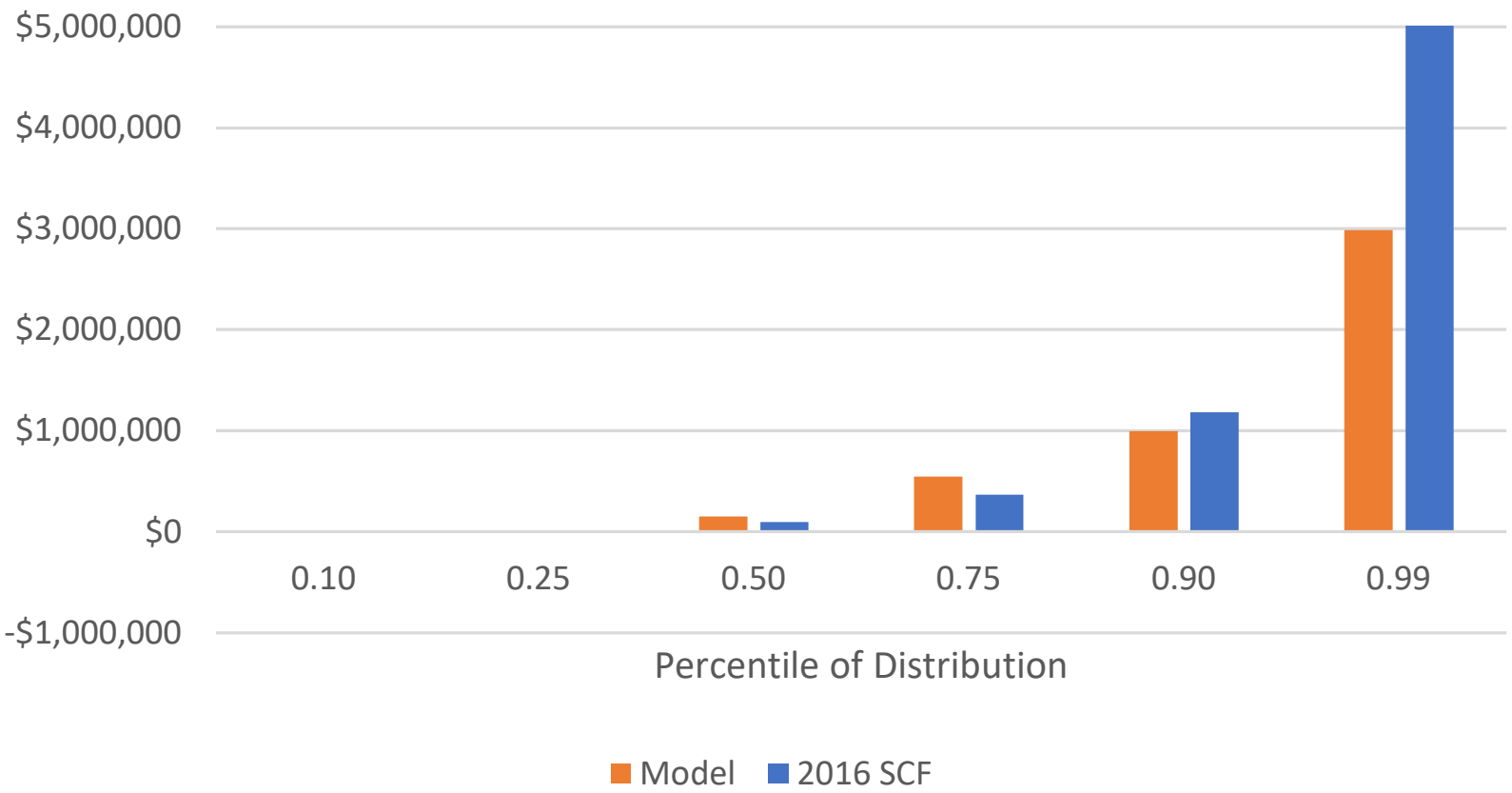
Source: 2016 Survey of Consumer Finances.

Calibration Results: Income Distribution



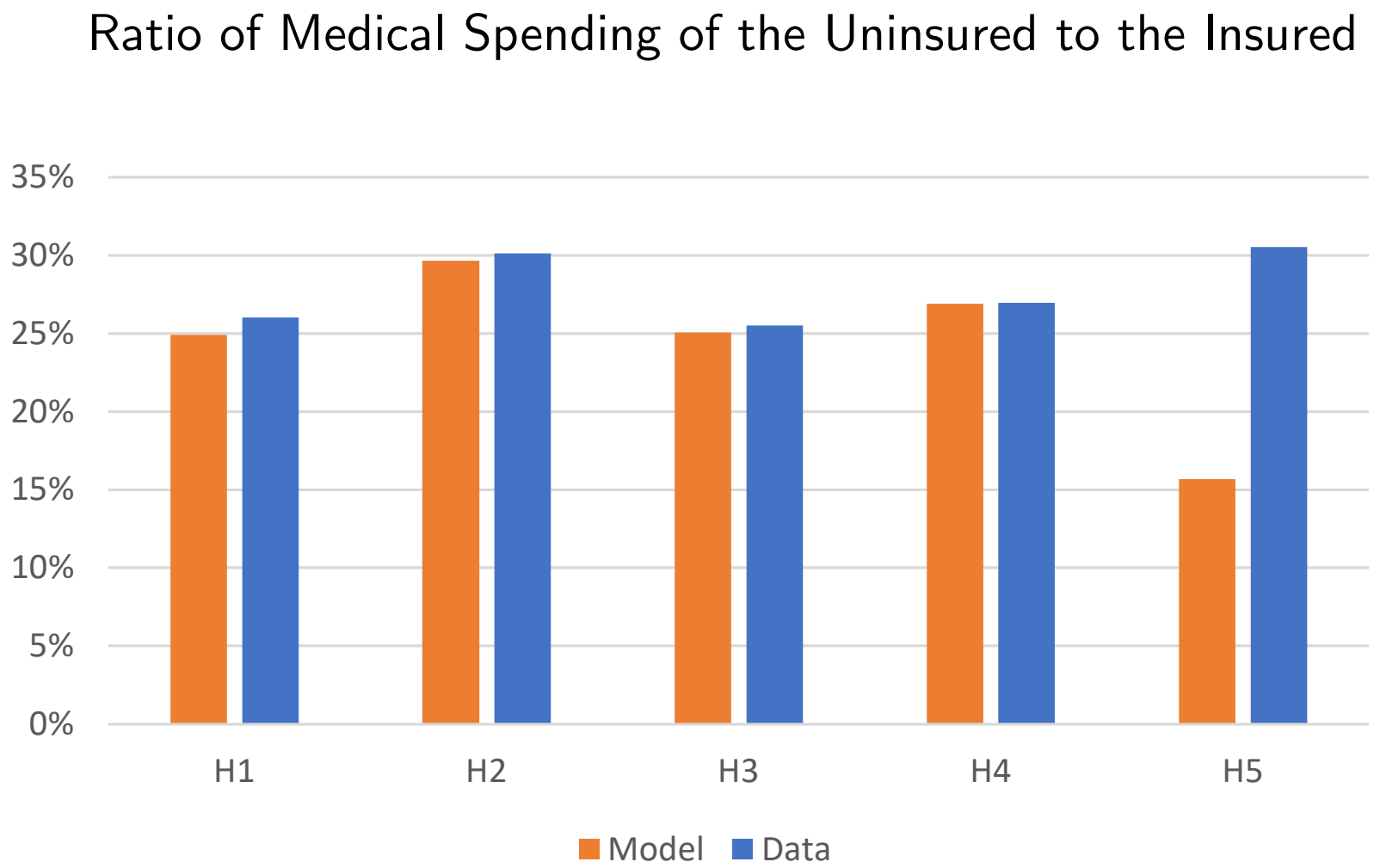
Source: 2016 Survey of Consumer Finances.

Calibration Results: Wealth Distribution



Source: 2016 Survey of Consumer Finances.

Calibration Results: Ratio of Medical Spending



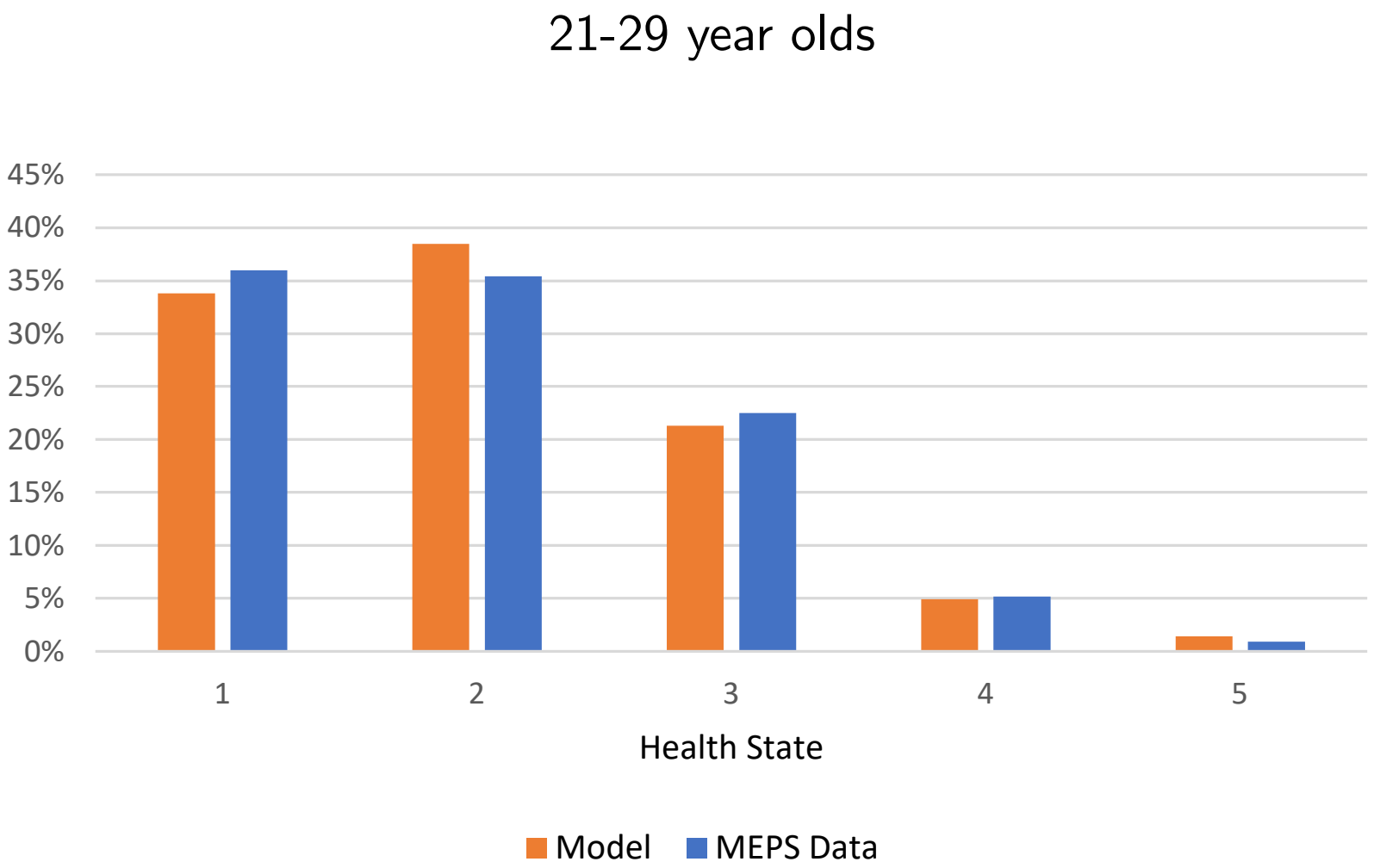
Source: MEPS data.

Calibration Results: Population not Receiving Medical Treatment

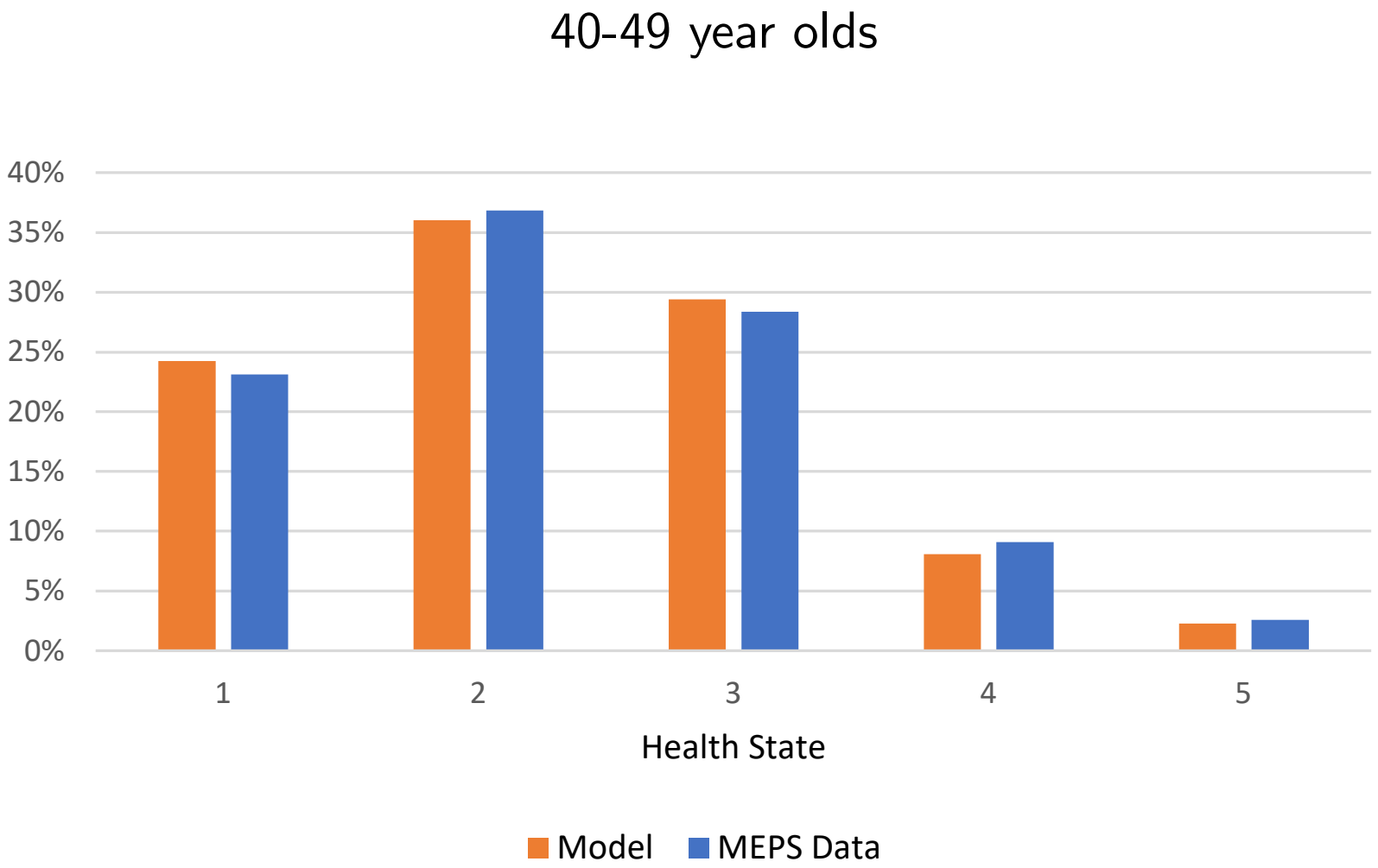
Model	Data
4.5%	4.7%

Source: National Health Interview Survey.

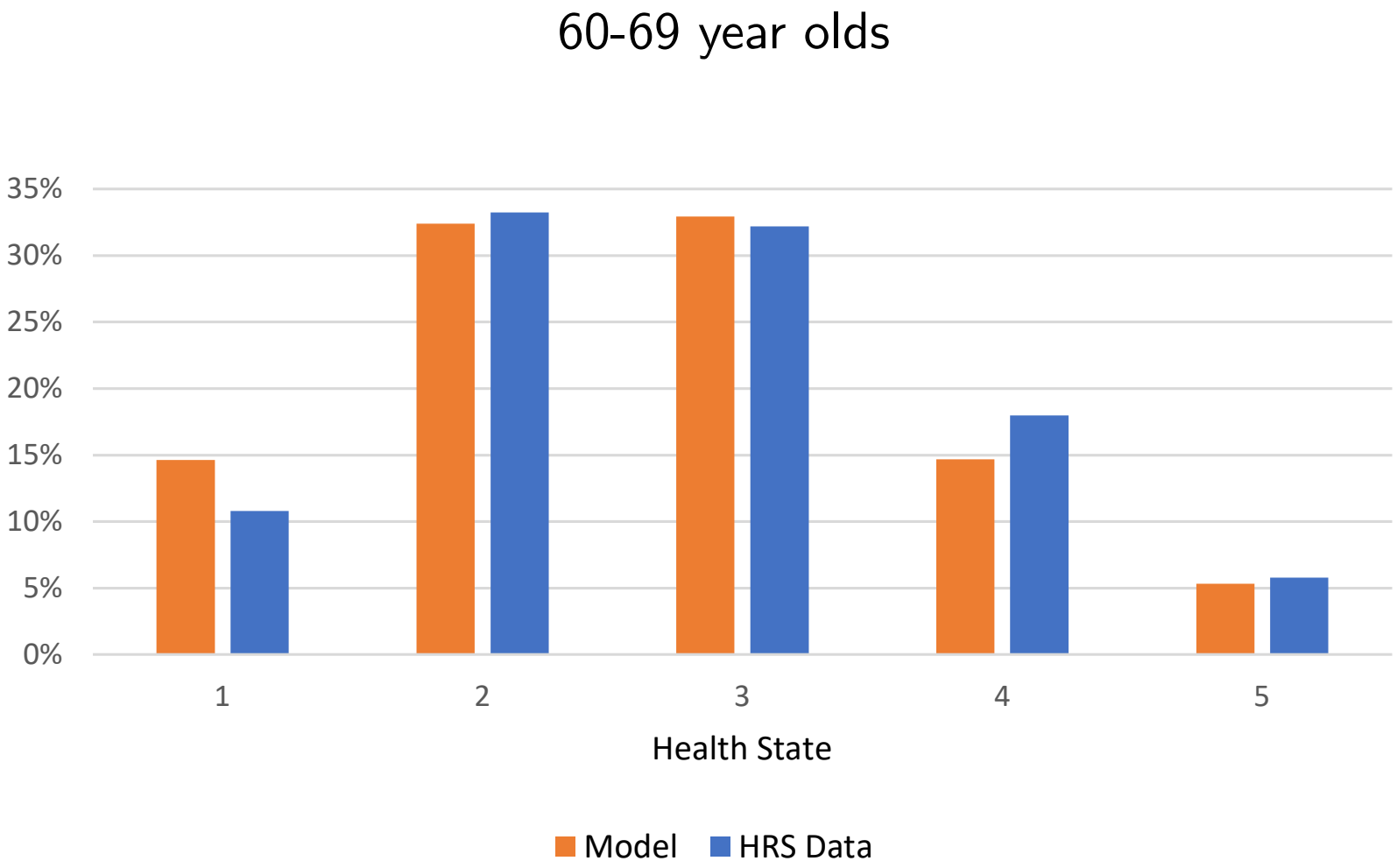
Population Distribution by Age and Health



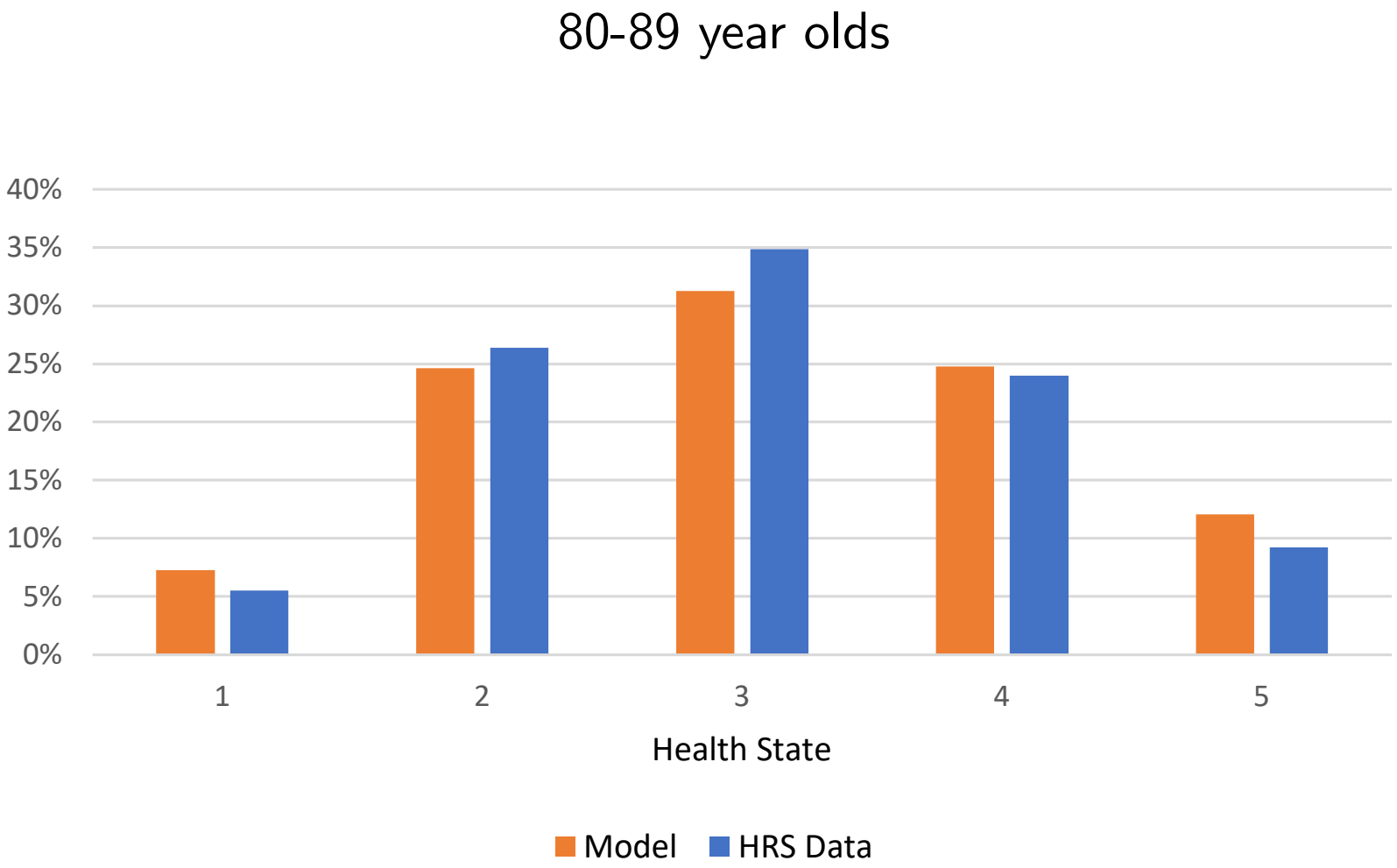
Population Distribution by Age and Health



Population Distribution by Age and Health



Population Distribution by Age and Health



Health Spending: Household Level

	Individual		Family	
Age of Head	Model	Data	Model	Data
21-64	$4,889	$4,565	$8,536	$7,341
21+	$6,150	$6,032	$9,917	$9,294
65+	$10,918	$11,390	$15,136	$15,929

Source: MEPS.

Health Spending: Economy Wide

	Model	Data
Total health expenses/GDP	8.6%	8.6%
Private insurance/GDP	3.7%	3.9%
Medicare/GDP	2.5%	2.4%
Medicaid/GDP	1.0%	1.0%
Out-of-pocket/GDP	1.5%	1.2%
Total health and admin expenses/GDP	9.6%	9.8%
Total admin costs/GDP	1.0%	1.2%
Private Insurance Premium	$6,025	$6,195

Source: MEPS, NHEA.

Results

Results: Roadmap

Policy 1: Expand Medicare to working age, only working age adults pay new premium (Premium WA)

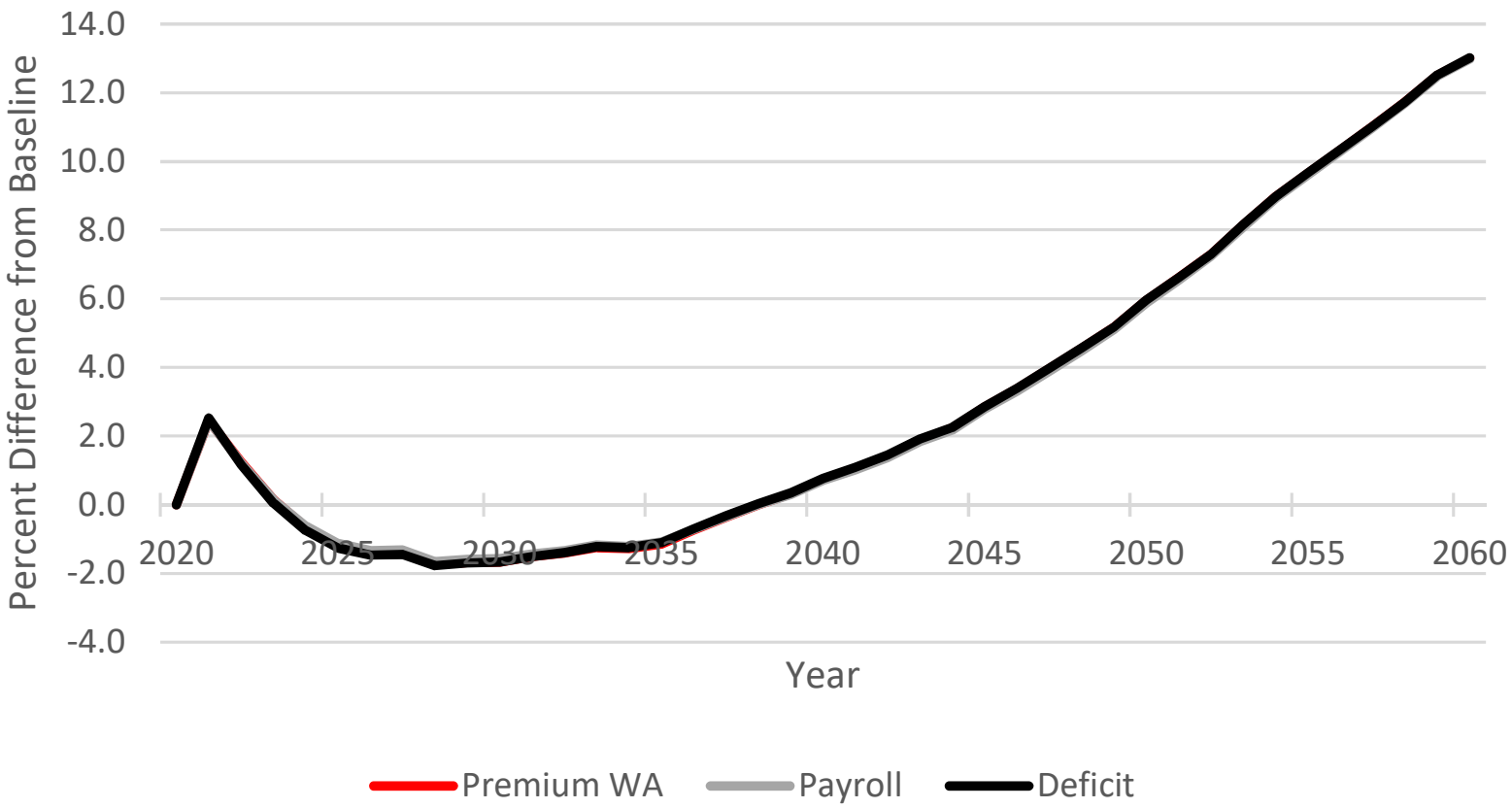
Policy 2: Payroll-financed (Payroll)

Policy 3: Deficit-financed (Deficit)

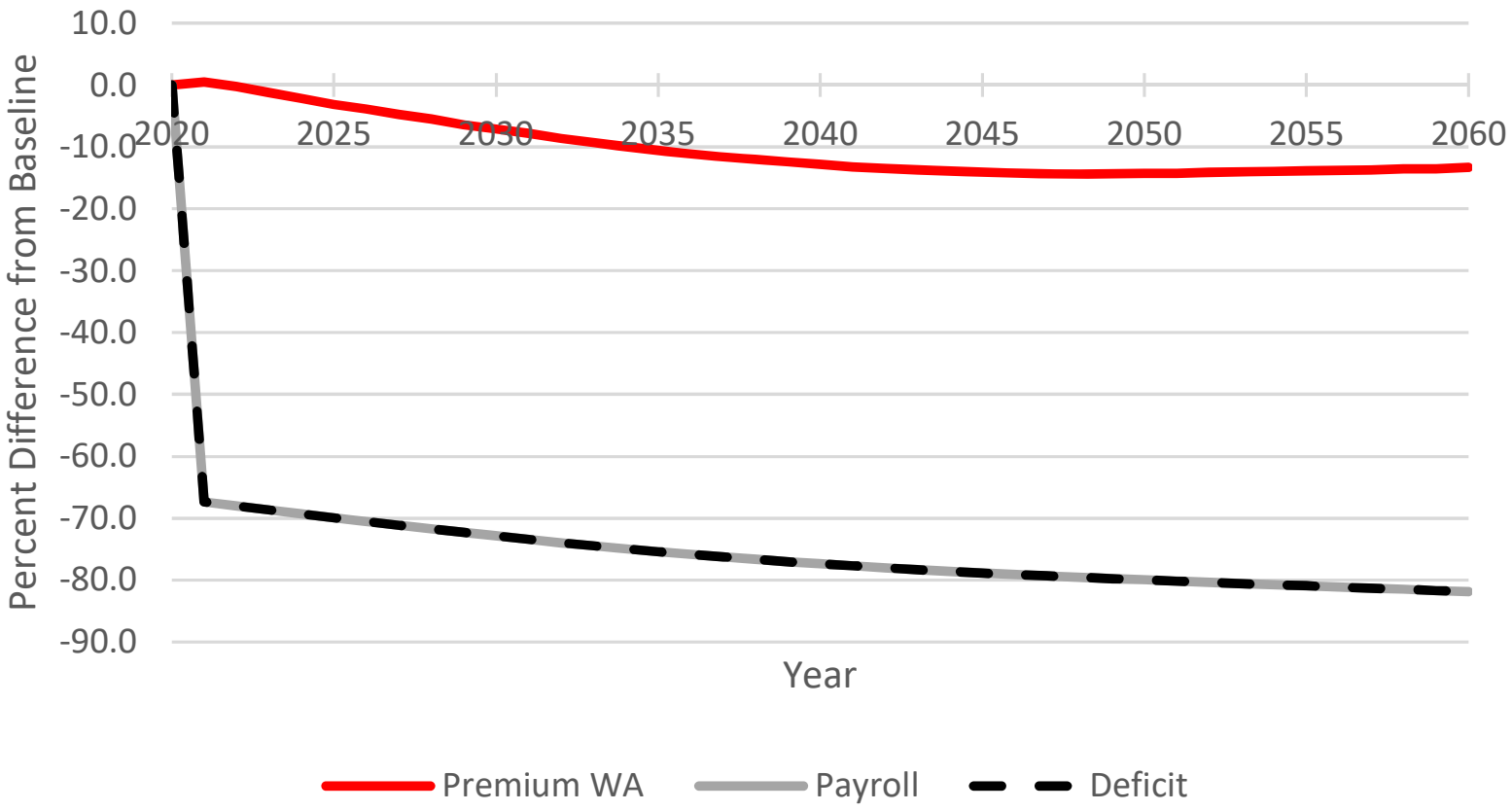
Note: We Do not Fix Medicare Shortfall

- Note that we **do not fix** the Medicare budget shortfall.
- We use increases in payroll tax rates and/or premiums to ensure that the Medicare expansion is budget neutral (except when deficit financed).
- Any changes in income or consumption tax revenues will be added to the general budget.

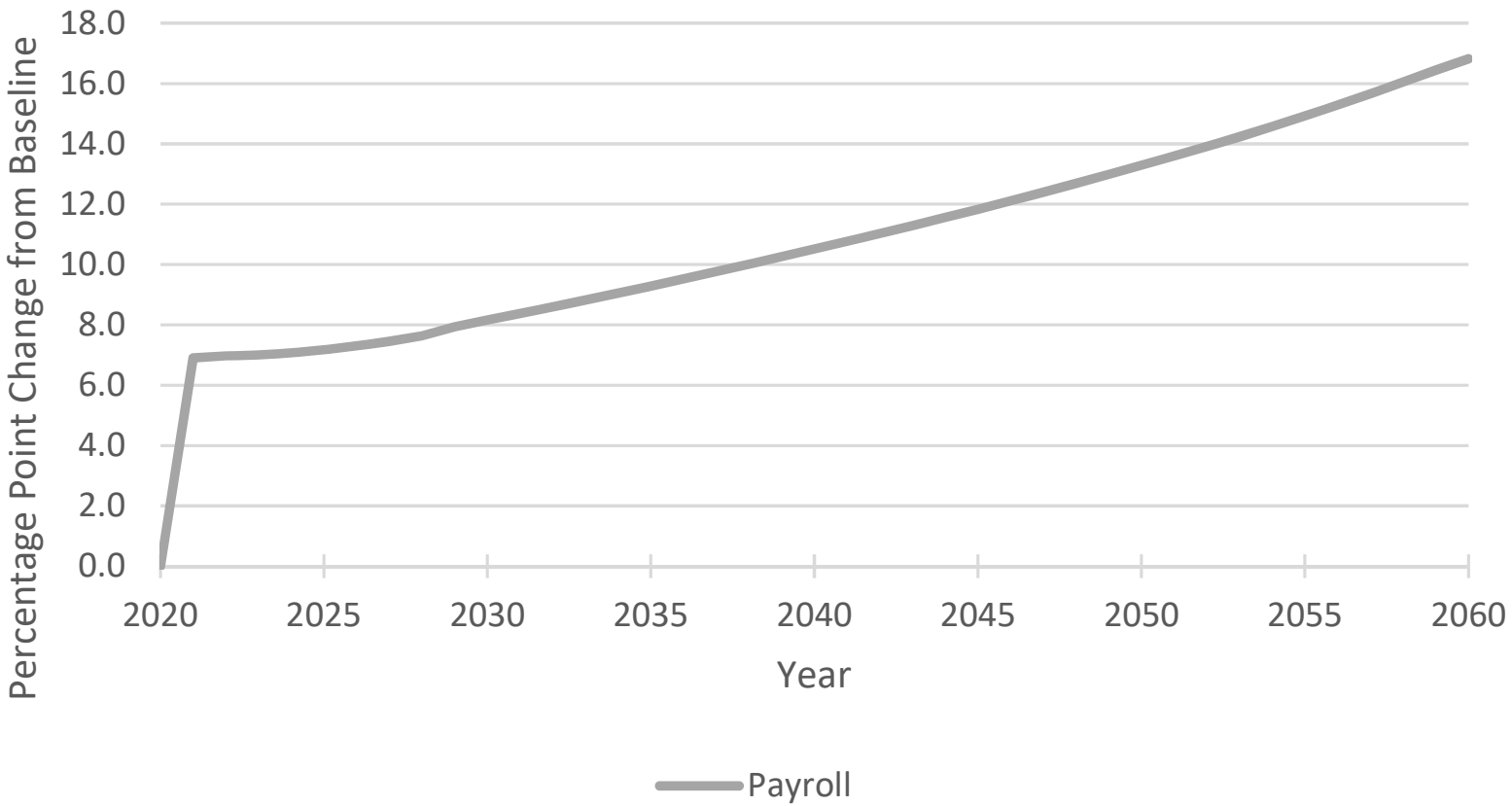
Difference in Total Health Spending



Difference in Individual Insurance Premiums



Increase in Payroll Tax Rates



Difference in Aggregate Out-of-Pocket Spending

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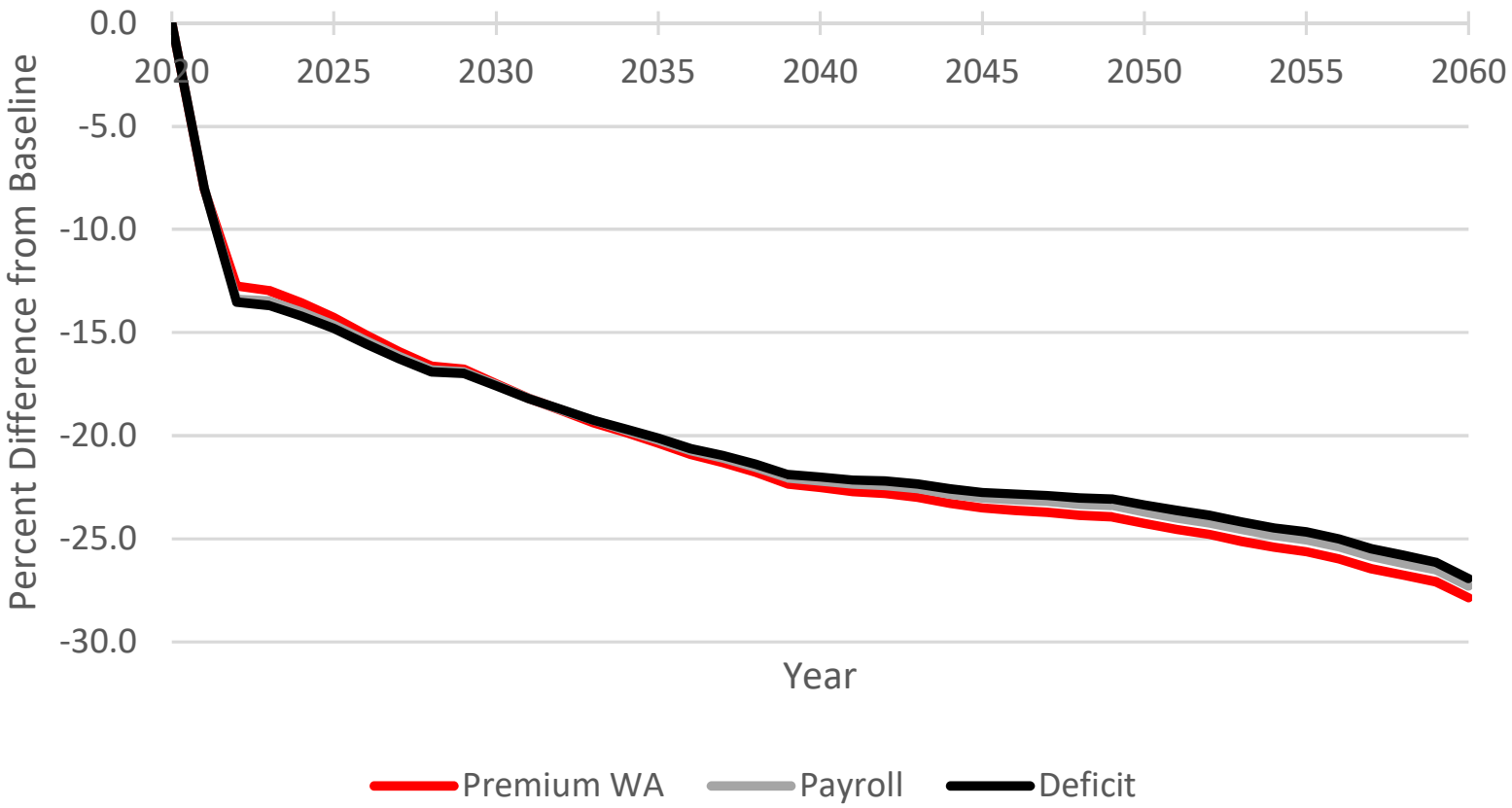
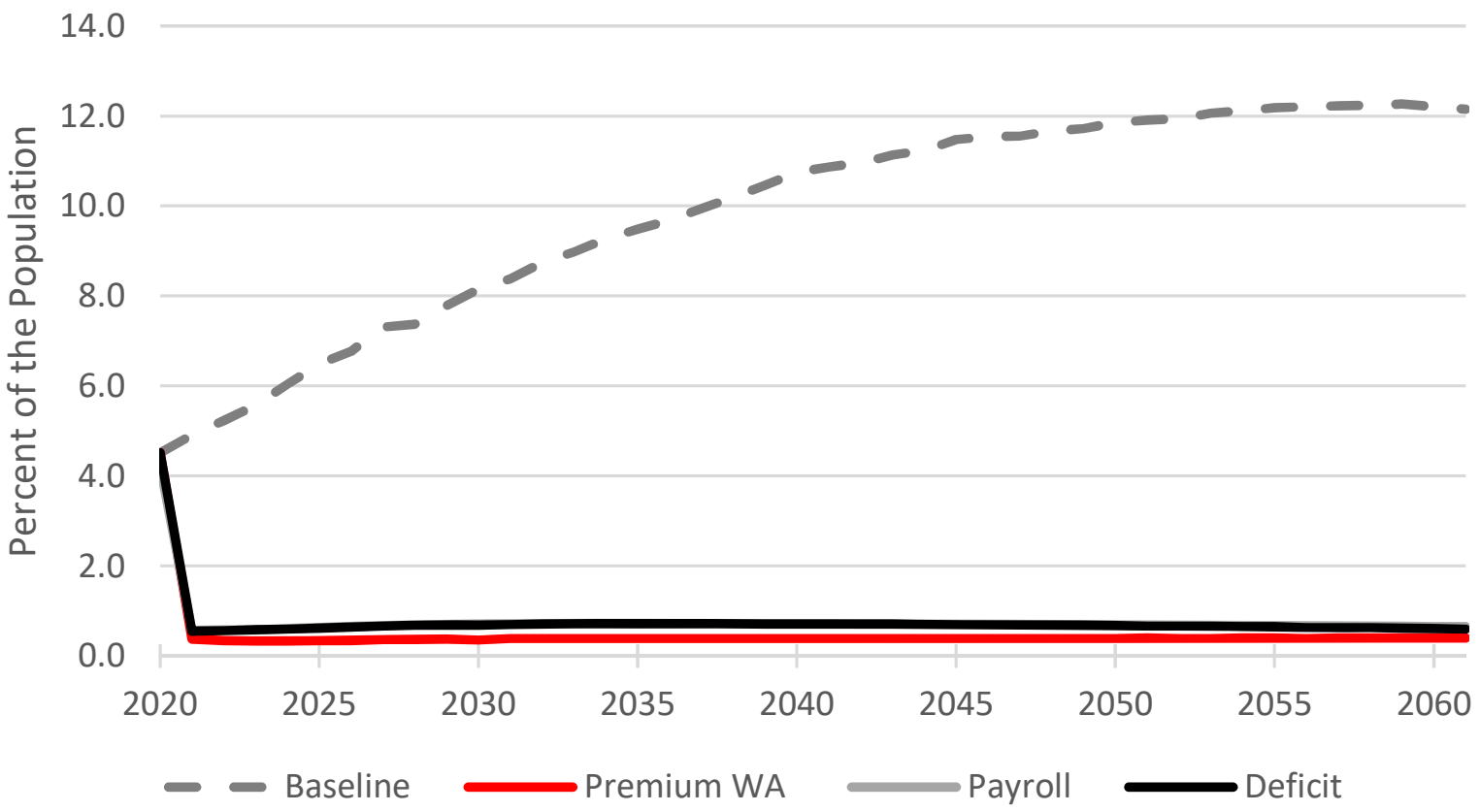
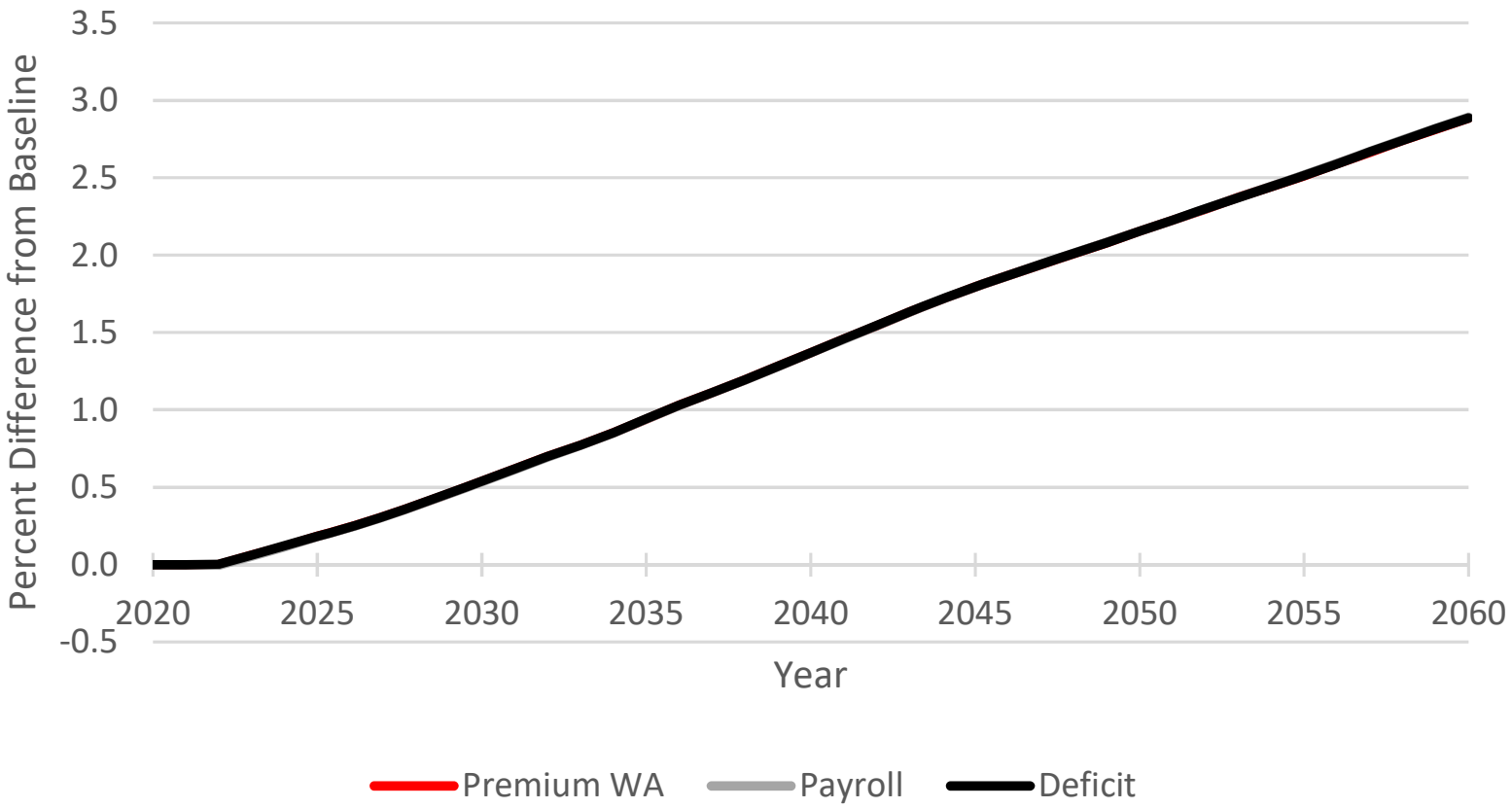


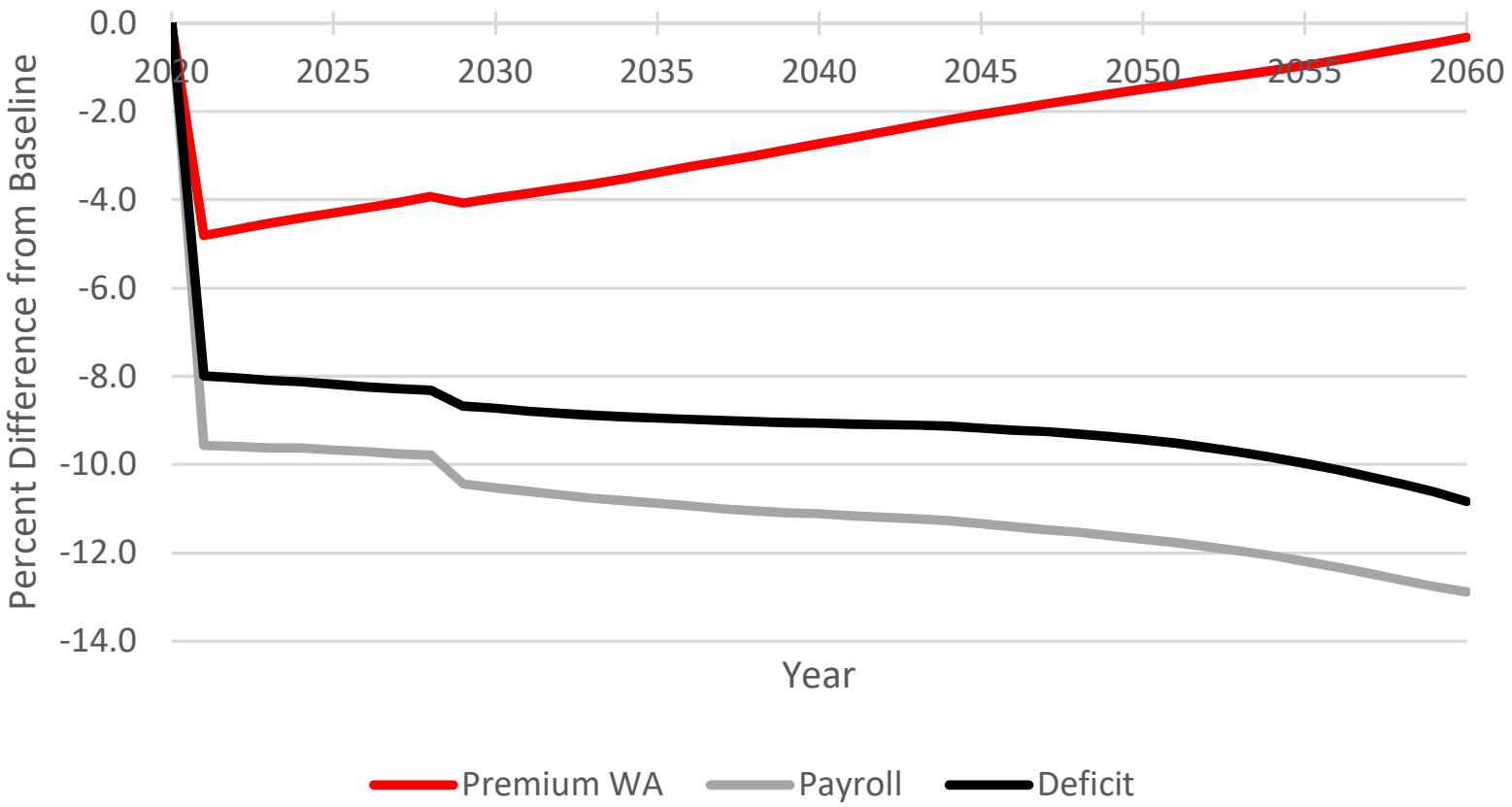
Forgone Medical Care over Time



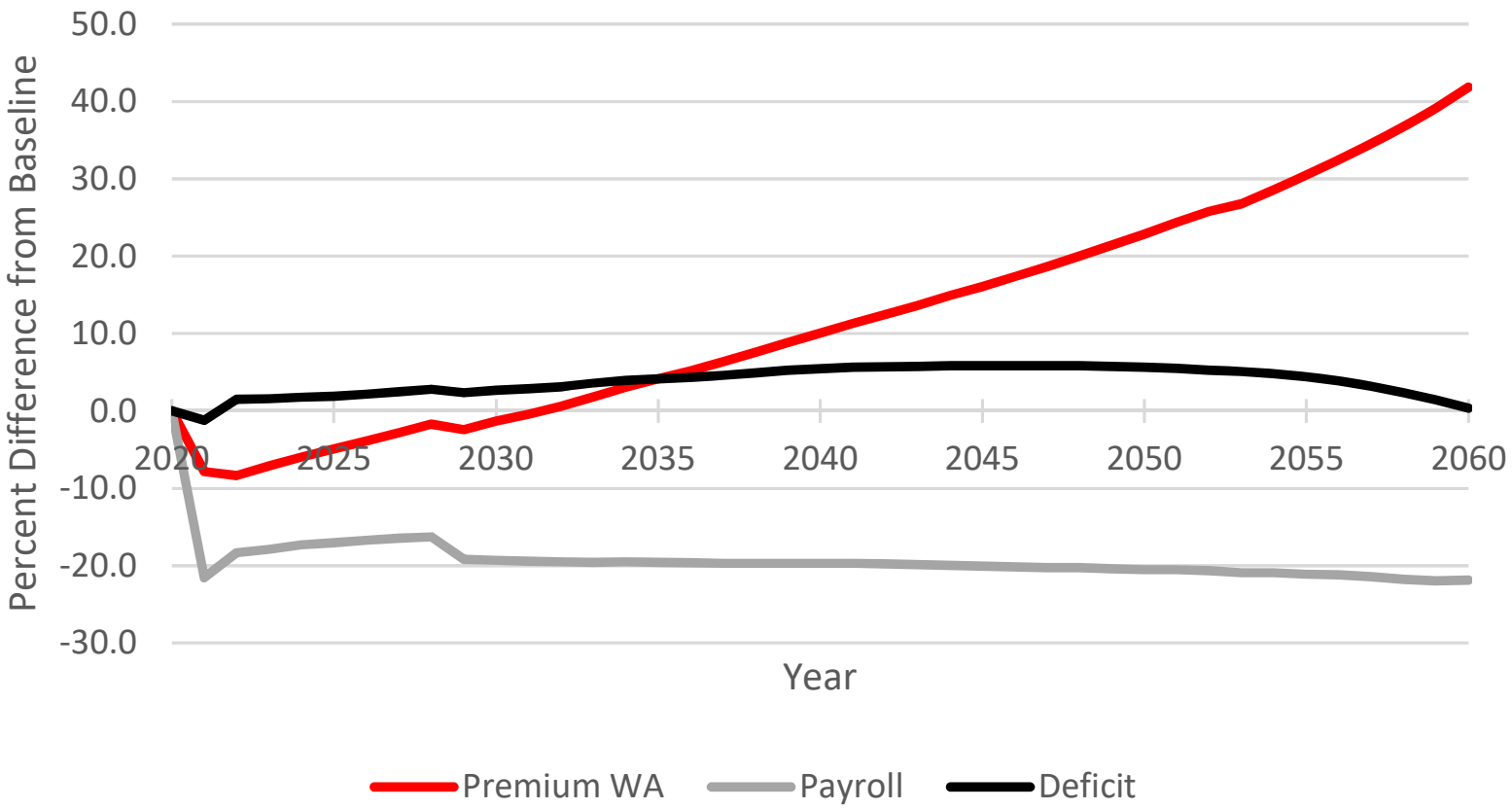
Difference in Population Size



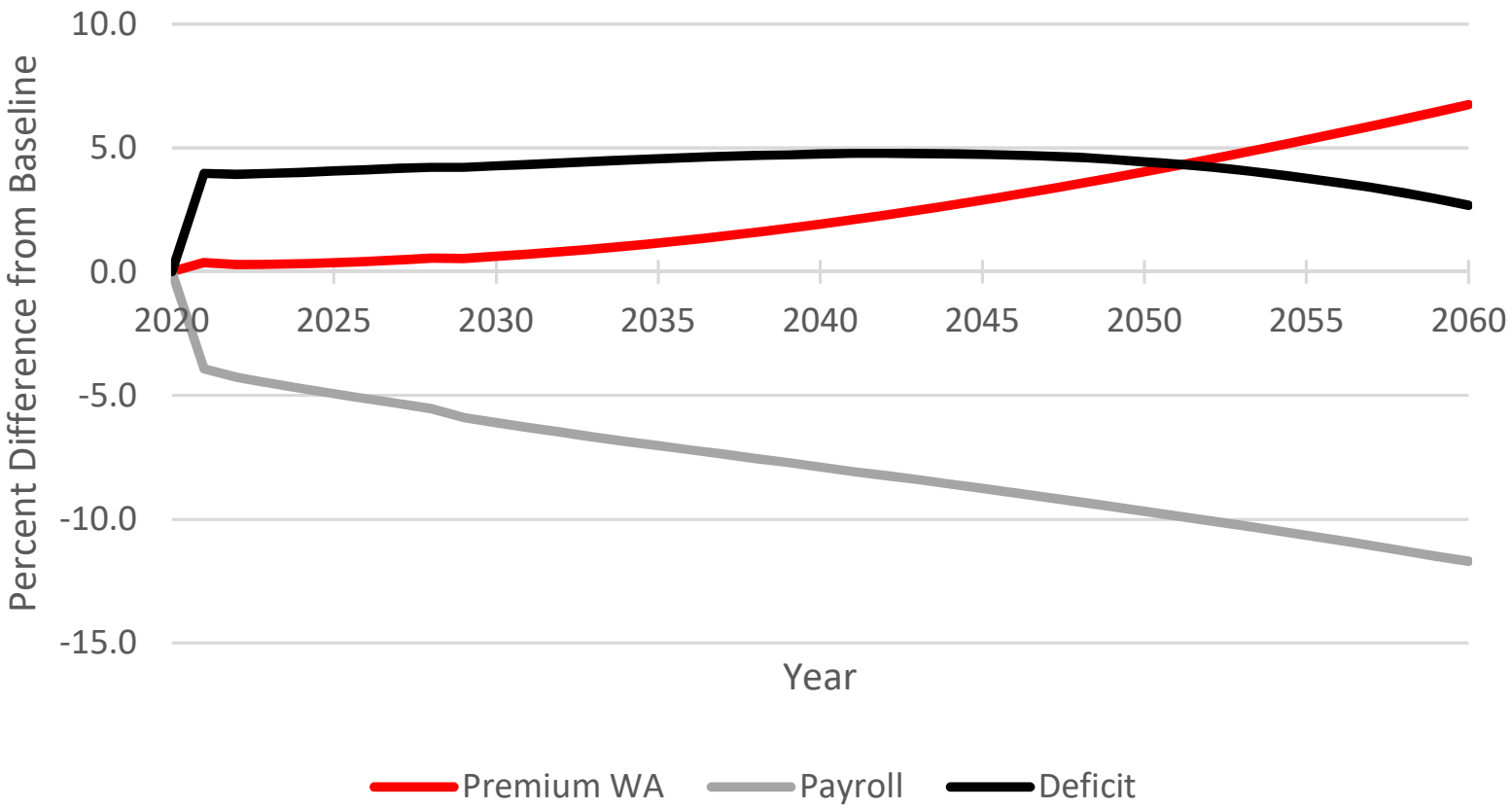
Difference in Hours Worked



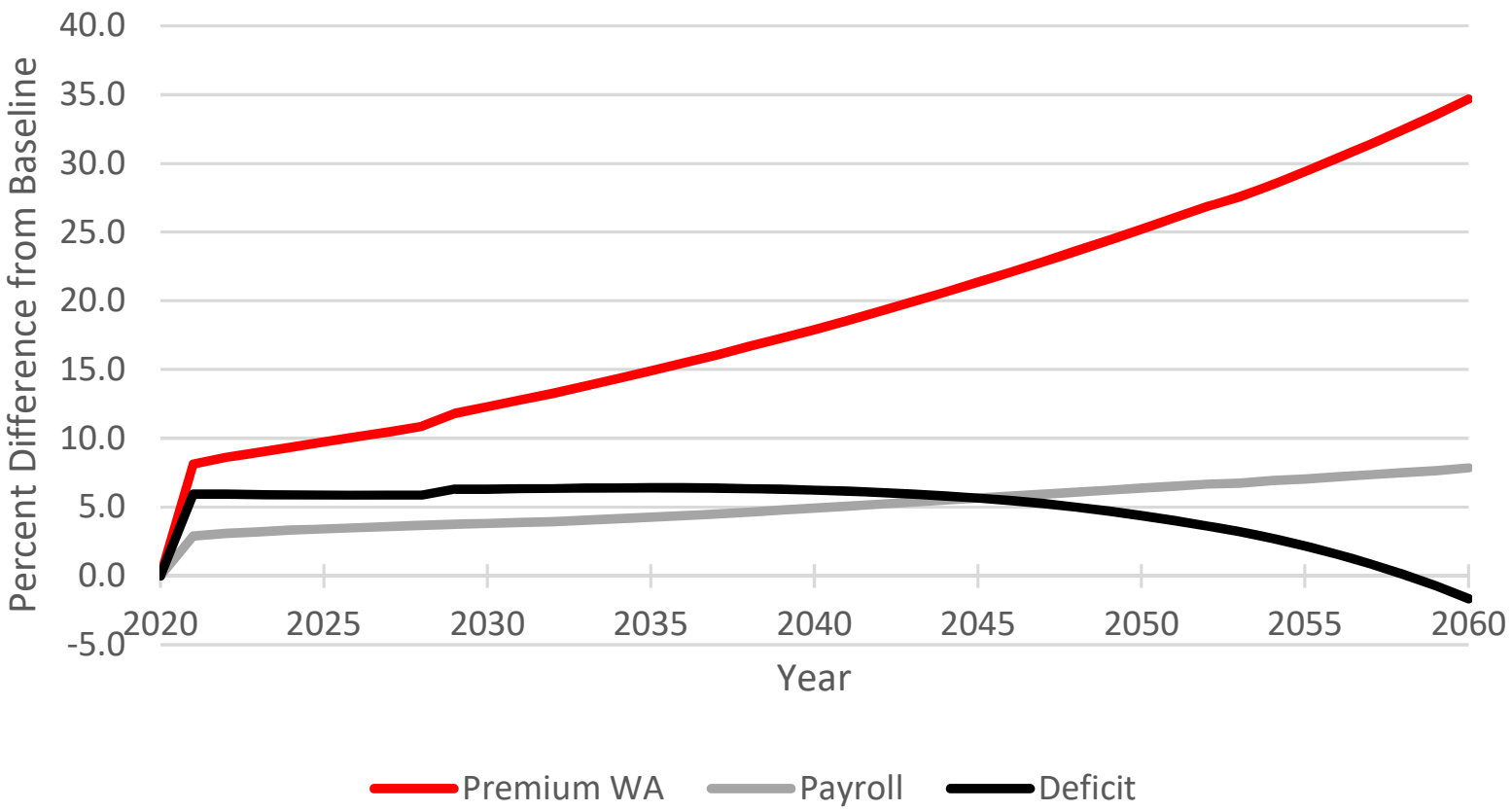
Difference in Private Savings



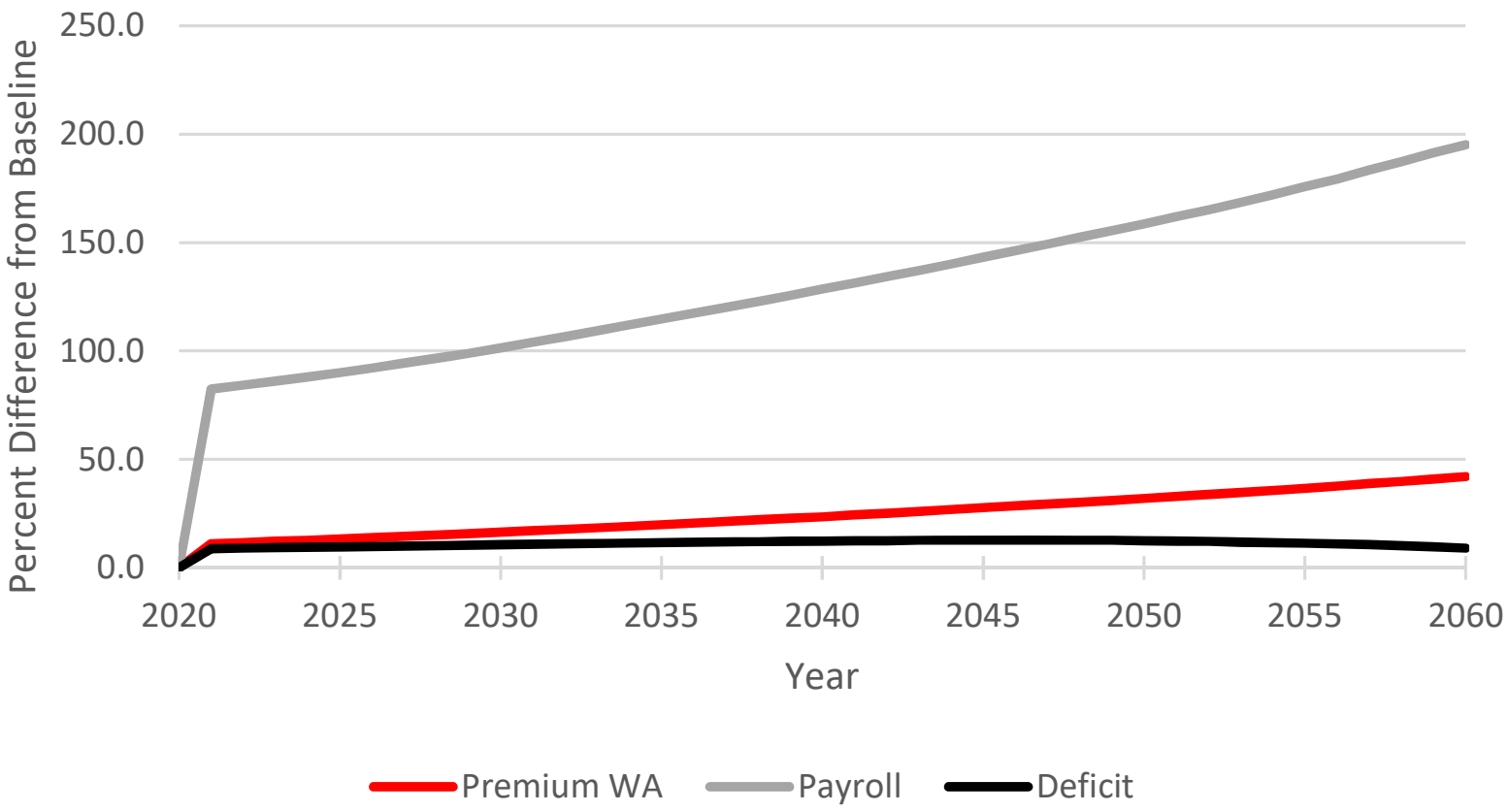
Difference in Consumption



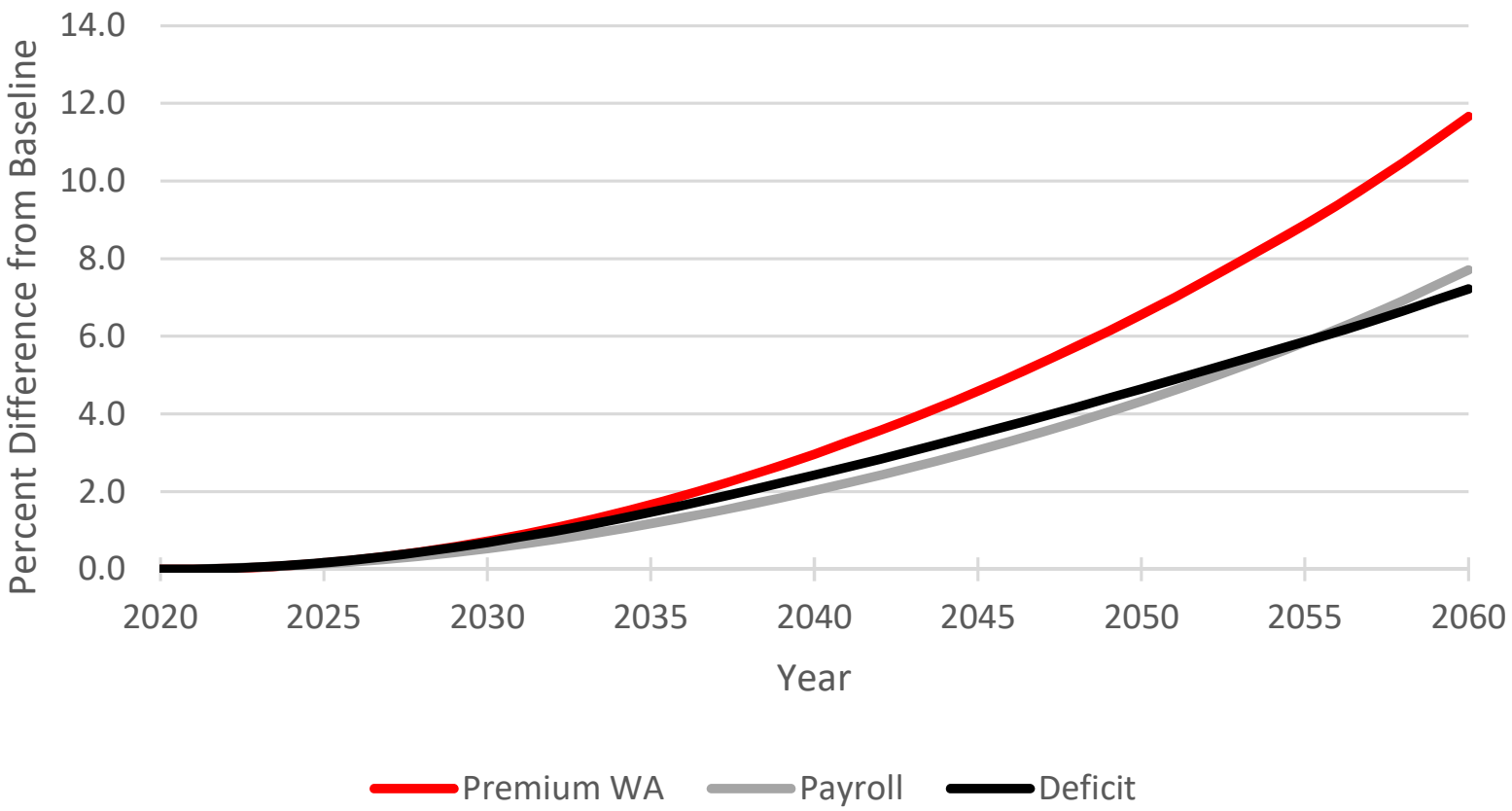
Difference in Income Tax Revenues



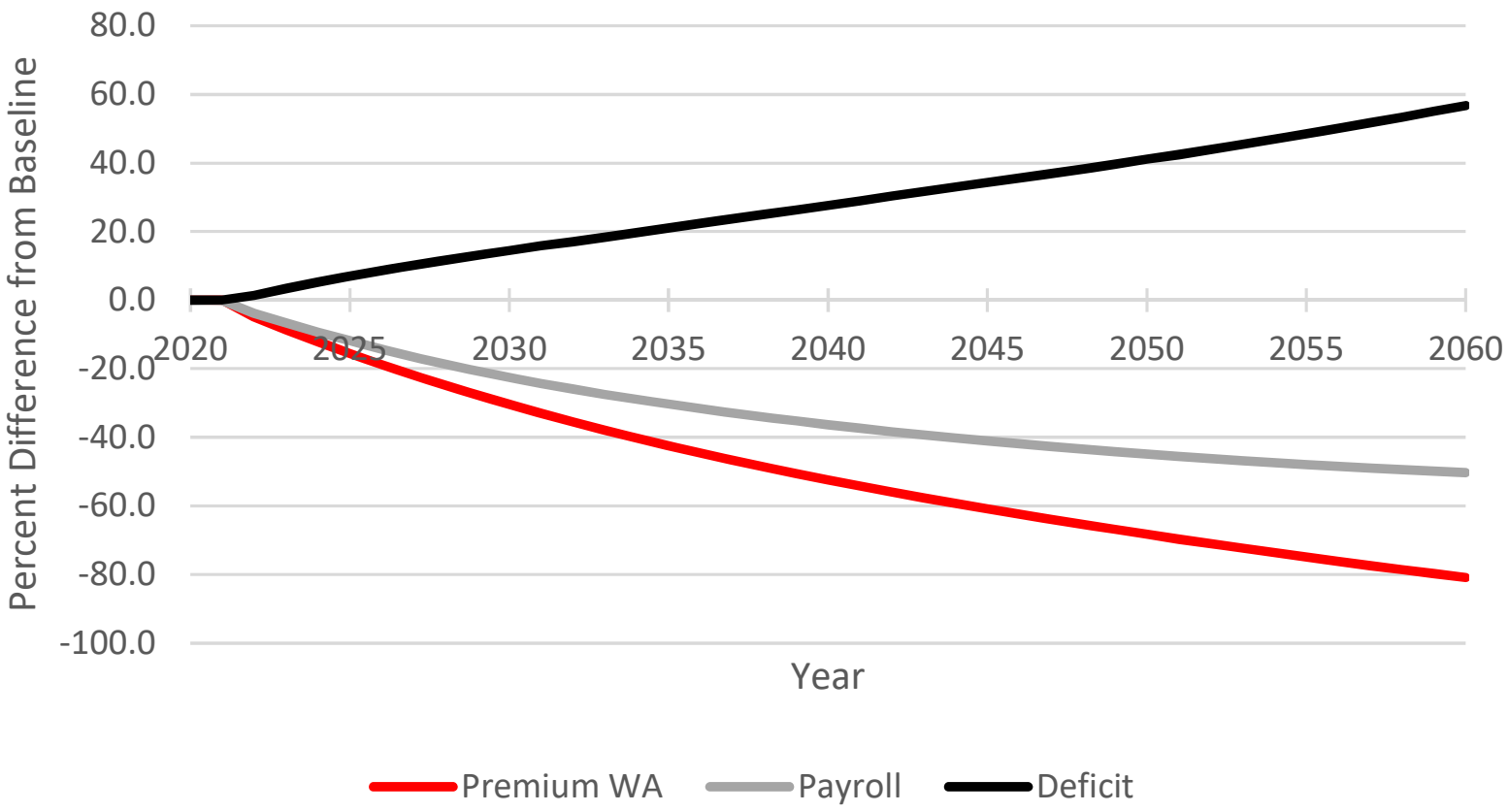
Difference in Payroll Tax Revenues



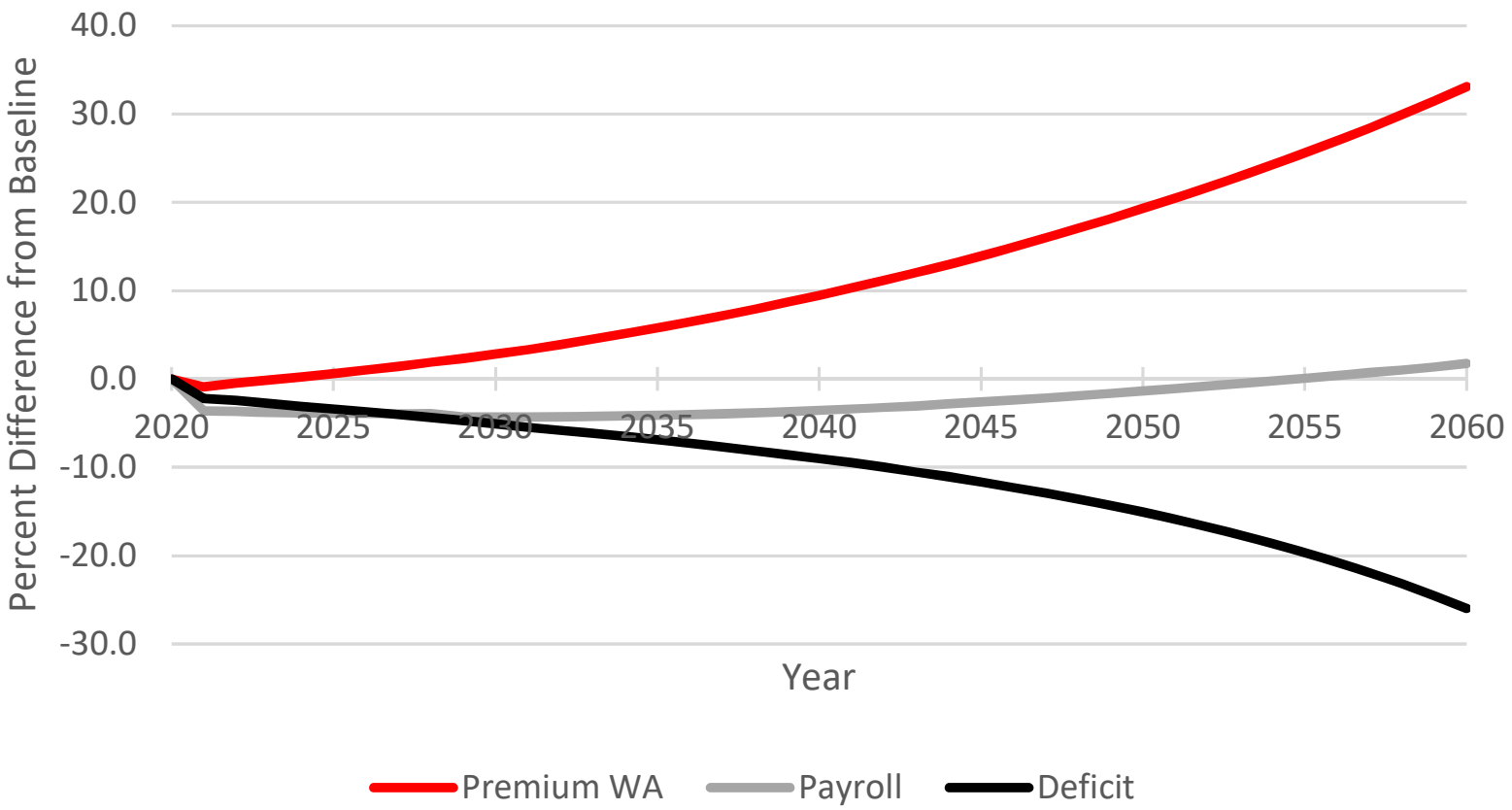
Difference in OASI Spending



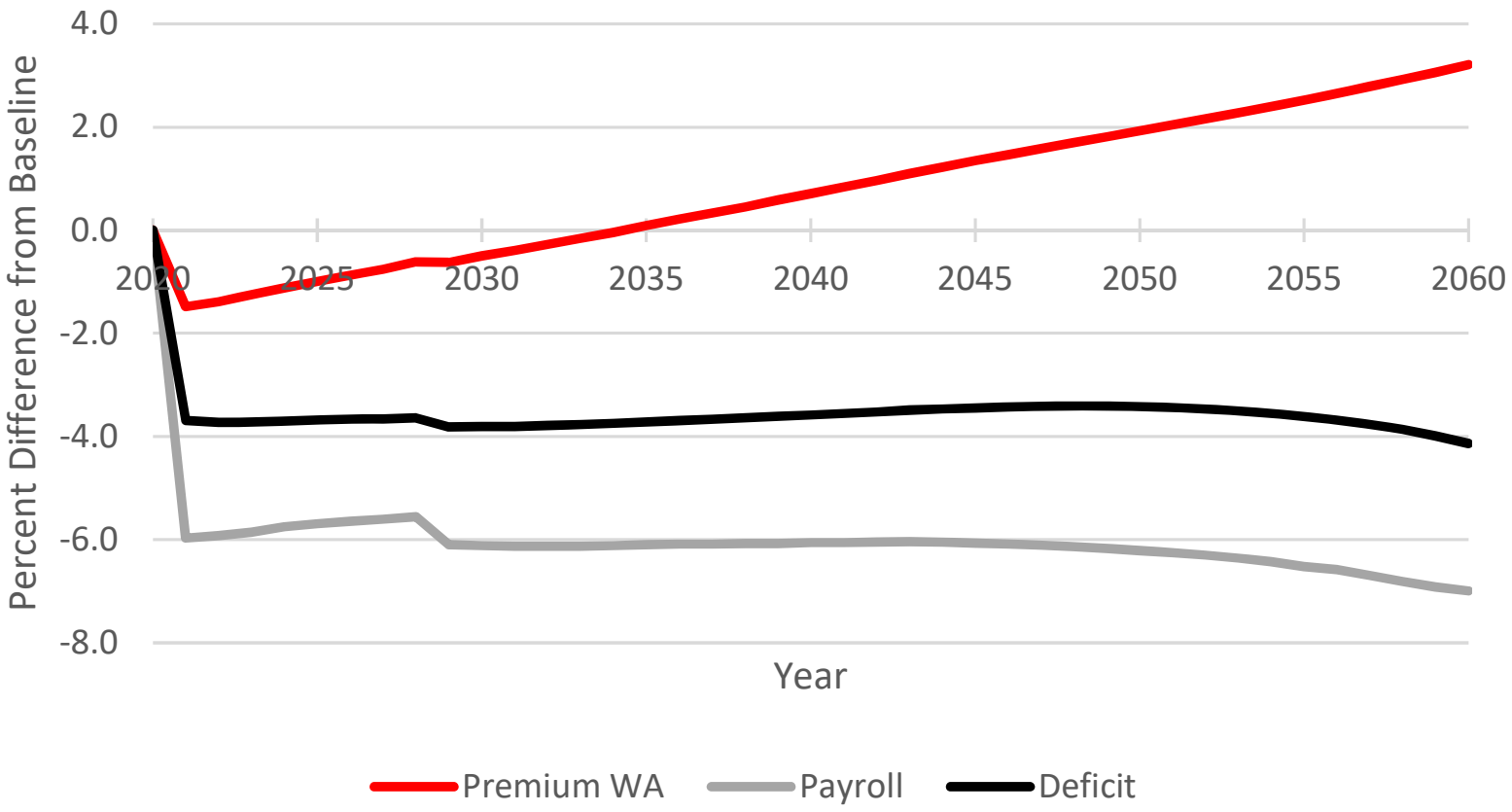
Difference in Debt



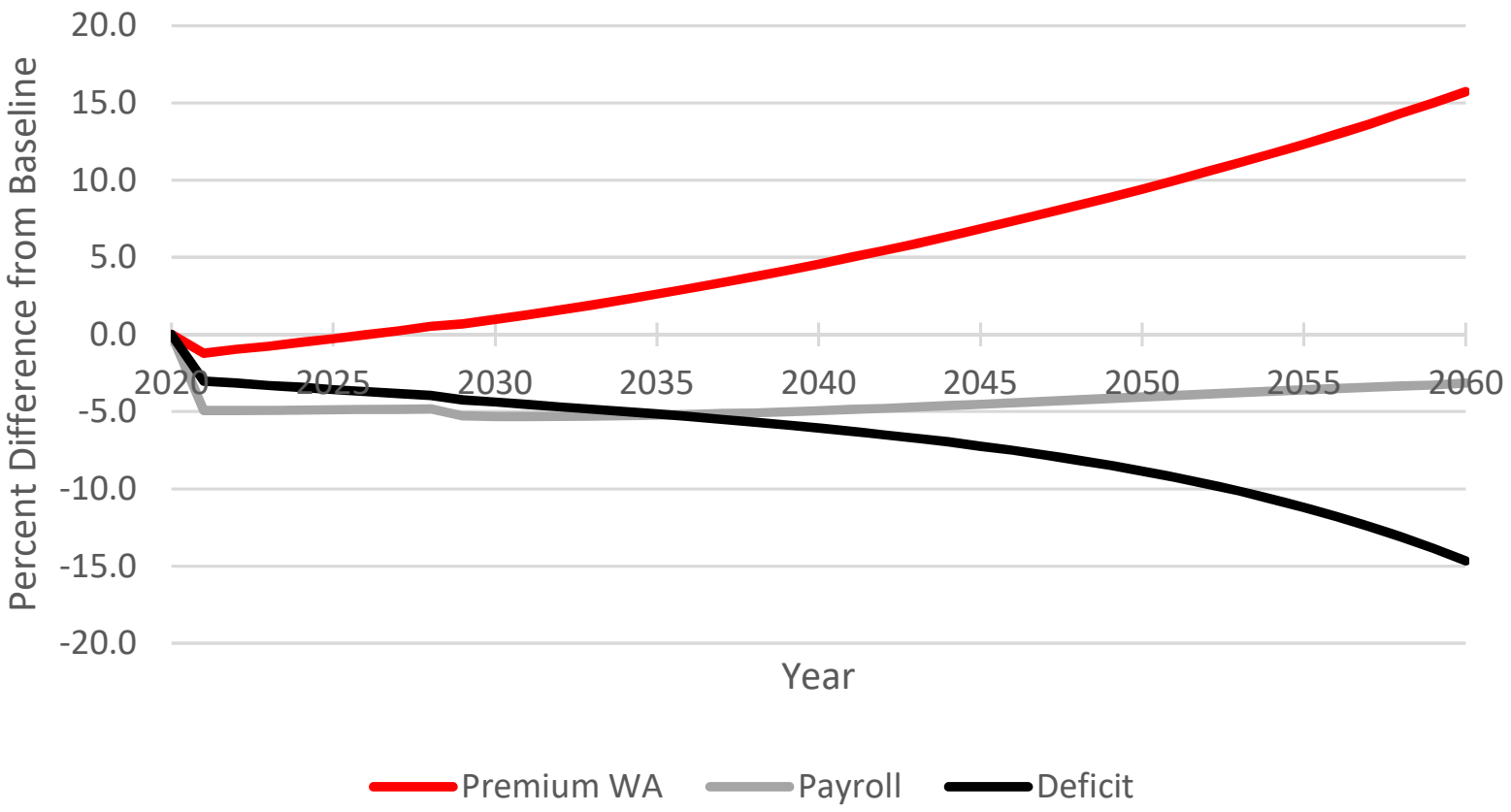
Difference in Capital



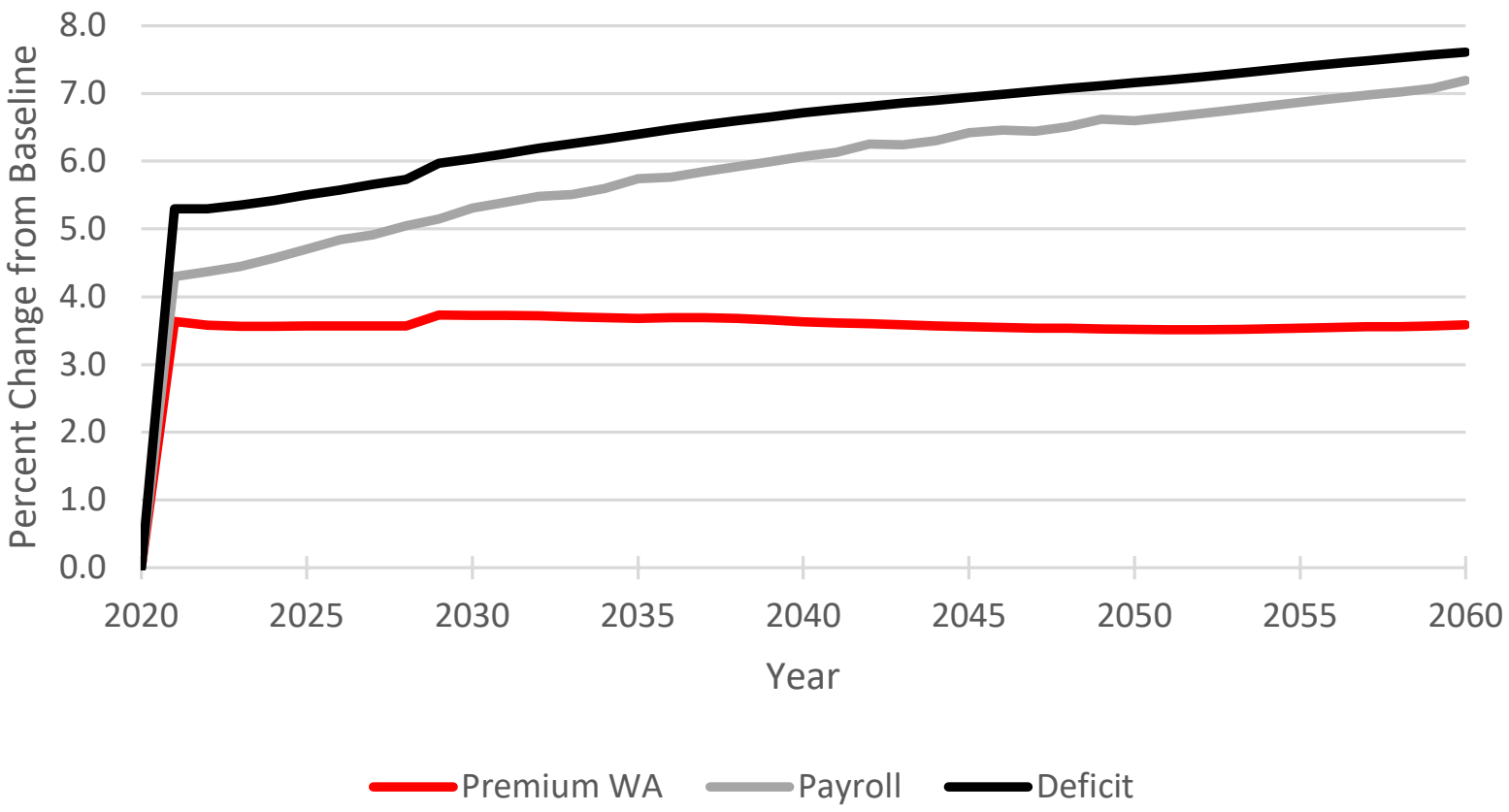
Difference in Labor Supply



Difference in Output



Difference in Wage per Efficiency Unit of Labor



APPENDIX

Model: Household's Preferences

Are combination of Cobb-Douglas and CRRA, and consistent with a balanced-growth path.

$$u(c, l) = \frac{\left[c^{\alpha} l^{1-\alpha}\right]^{1-\gamma}}{1-\gamma}$$

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Model: Representative Firm

$$\max_{\tilde{K}_t \, \tilde{N}_t} F(\tilde{K}_t, \tilde{N}_t) - (r_t + \delta)\tilde{K}_t - w_t \tilde{N}_t,$$

where

$$F(\tilde{K}_t \, \tilde{N}_t) = A \, \tilde{K}_t^{\theta} \, \tilde{N}_t^{1-\theta}$$

and

$$F_K(\tilde{K}_t \, \tilde{N}_t) = r_t + \delta \qquad F_L(\tilde{K}_t \, \tilde{N}_t) = w_t$$

and

$$N = \sum_{j=1}^{J_R - 1} \int_{A \times B \times E \times H \times INS} e \, n(\mathbf{s}, \mathbf{S}_t; \mathbf{\Omega_t}) dX_t(\mathbf{s})$$

$$W_{P,t} = \sum_{j=1}^{J} \int_{A \times B \times E \times H \times INS} a \; dX_t(\mathbf{s}), \qquad K_t = W_{P,t} + W_{G,t}$$

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Model: Government Revenues

$$T_{I,t} = \sum_{j=1}^{J^{max}} \int_{A\times B\times E\times H\times INS} \tau_{I,t}\Big(r_t a + w_t\, e\, n(\mathbf{s}, \mathbf{S}_t; \mathbf{\Omega_t}) - 1_{\{.\}} p^{ins}\Big) dX_t(\mathbf{s})$$

$$T_{P,t}(\overline{\tau}_{P,t}) = \sum_{j=1}^{J_R-1} \int_{A\times B\times E\times H\times INS} \tau_{P,t}\Big(w_t\, e\, n(\mathbf{s}, \mathbf{S}_t; \mathbf{\Omega_t}) - 1_{\{.\}} p^{ins}\Big) dX_t(\mathbf{s})$$

$$T_{C,t}(\tau_{C,t}) = \tau_{C,t} \sum_{j=1}^{J^{max}} \int_{A\times B\times E\times H\times INS} c(\mathbf{s}, \mathbf{S}_t; \mathbf{\Omega_t}) dX_t(\mathbf{s})$$

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Model: Government Outlays

$$TR_{SS,t}(\psi_t) = \sum_{j=J_R}^{J^{max}} \int_{A\times B\times E\times H} tr_{SS,t}(j, b; \psi_t) dX_t(\mathbf{s})$$

$$TR_{MCare,t} = \sum_{j=J_R}^{J^{max}} \int_{A\times B\times E\times H\times X} \left(1 - \gamma^{ins=3}(m)\right) m(j, h, \chi)\, dX_t(\mathbf{s})$$

$$TR_{MCaid,t} = \pi \sum_{j=1}^{J^{max}} \int_{A\times B\times E\times H\times X} \left(1 - \gamma^{ins=4}(m)\right) m(j, h, \chi)\, dX_t(\mathbf{s})$$

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Model: Government Surplus

$$W_{G,t+1} = \frac{1}{(1+\mu)(1+\nu)}\Big[(1+r_{d,t})W_{G,t}$$

$$+ T_{I,t} + T_{P,t}(\overline{\tau}_{P,t}) + T_{C,t}(\tau_{C,t})$$

$$- TR_{SS,t}(\psi_t) - TR_{MCare,t} - 0.65\,TR_{MCaid,t} - C_{G,t}\Big]$$

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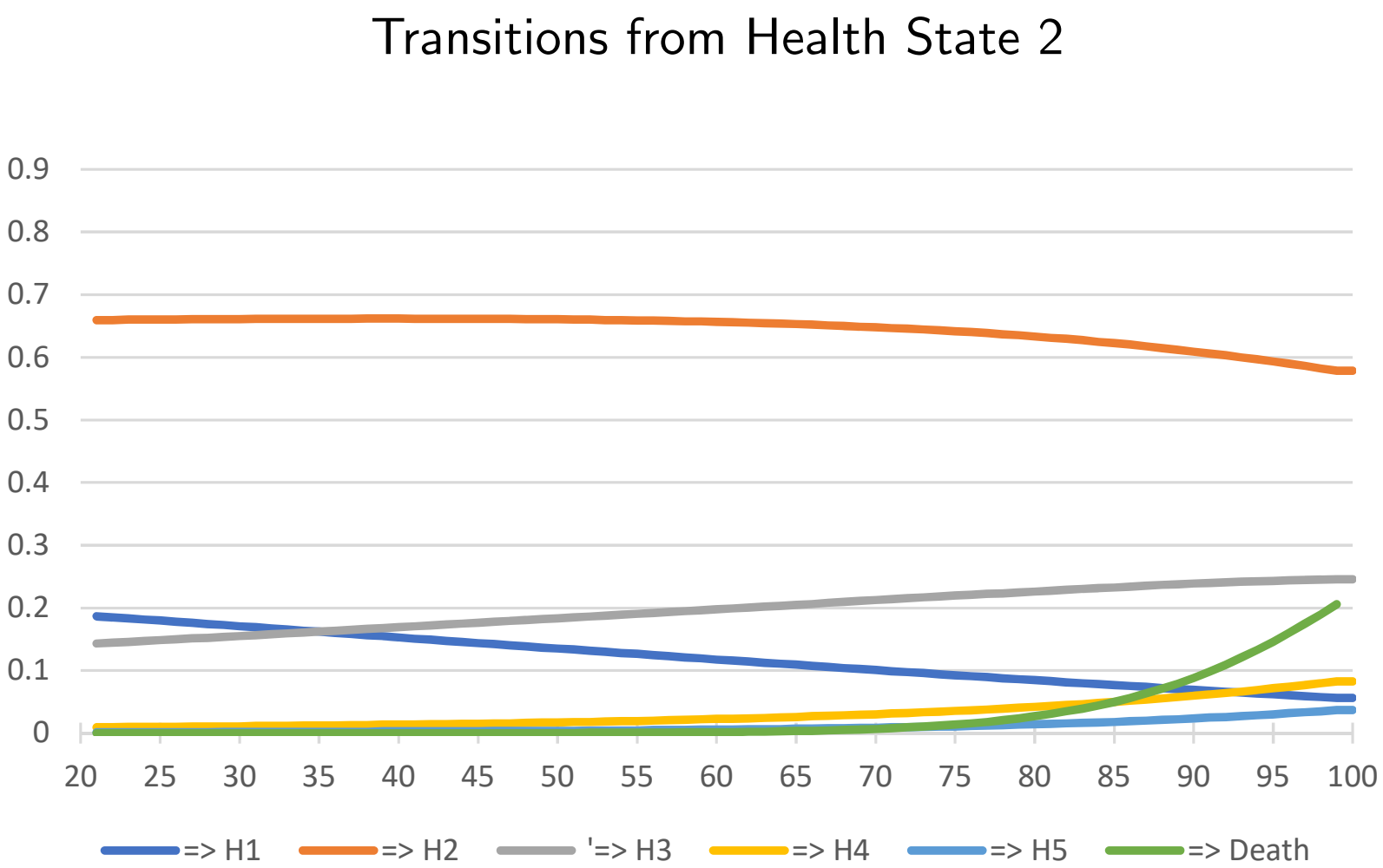
Health Transitions for those who pay for care



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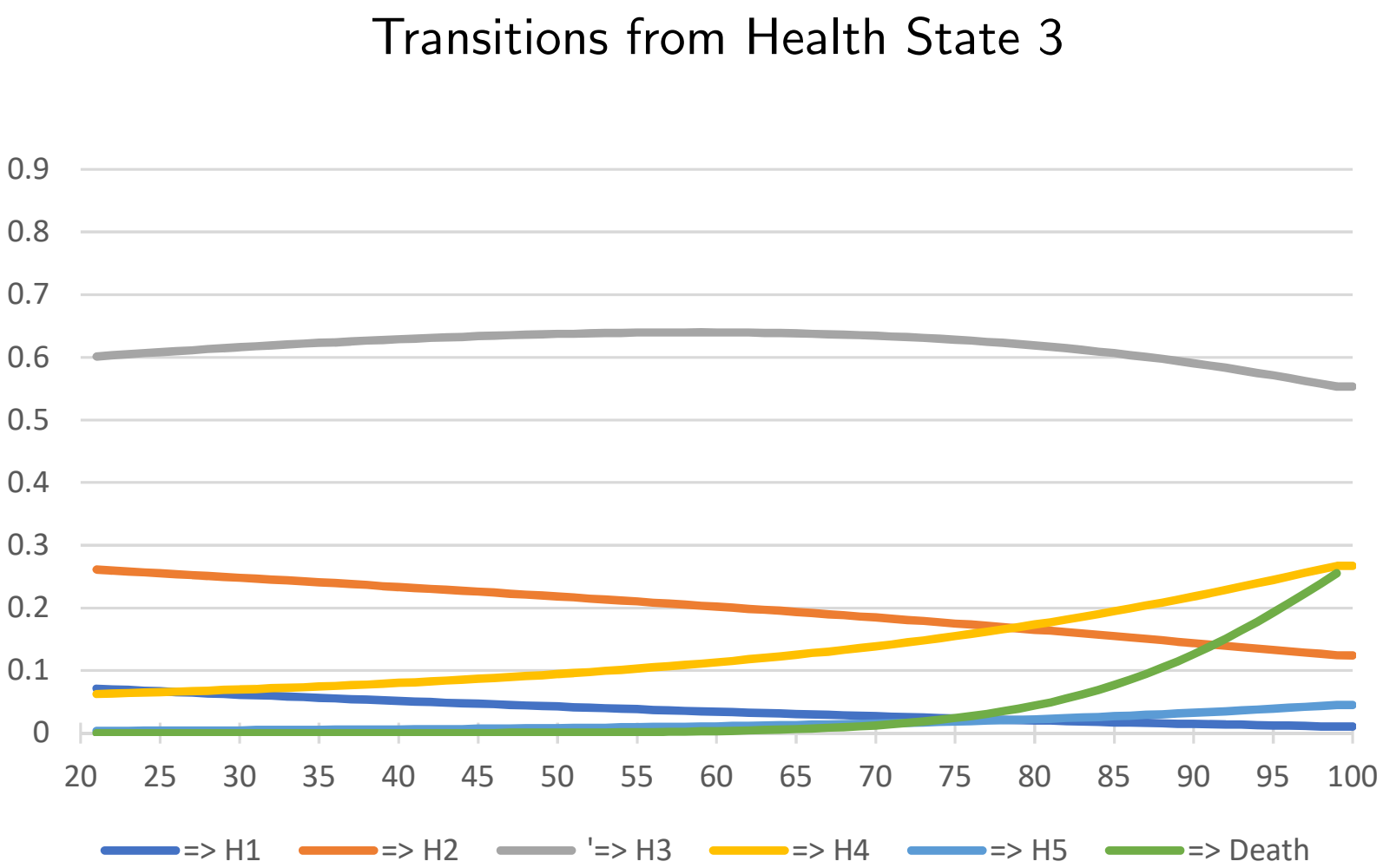
Health Transitions for those who pay for care



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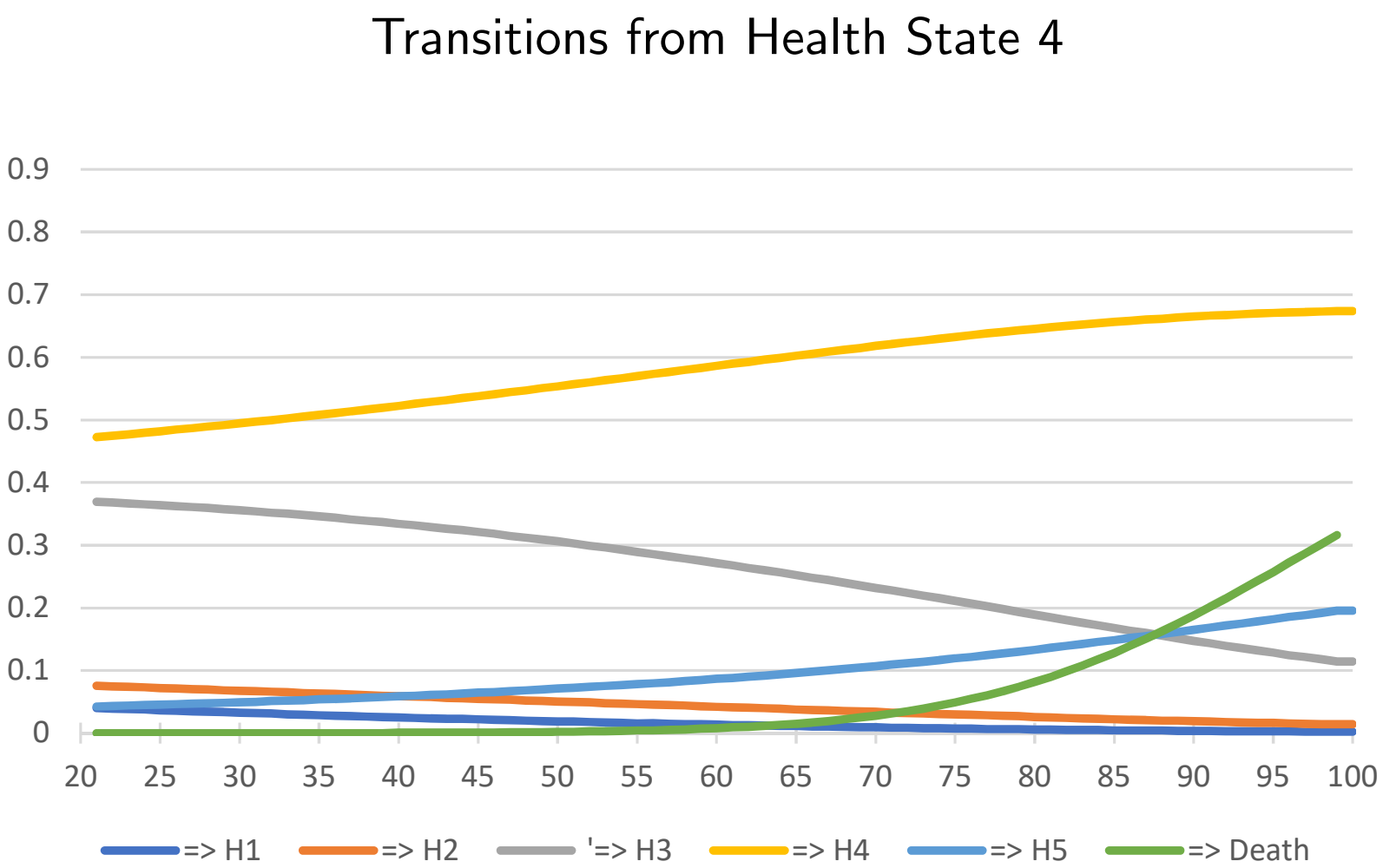
Health Transitions for those who pay for care



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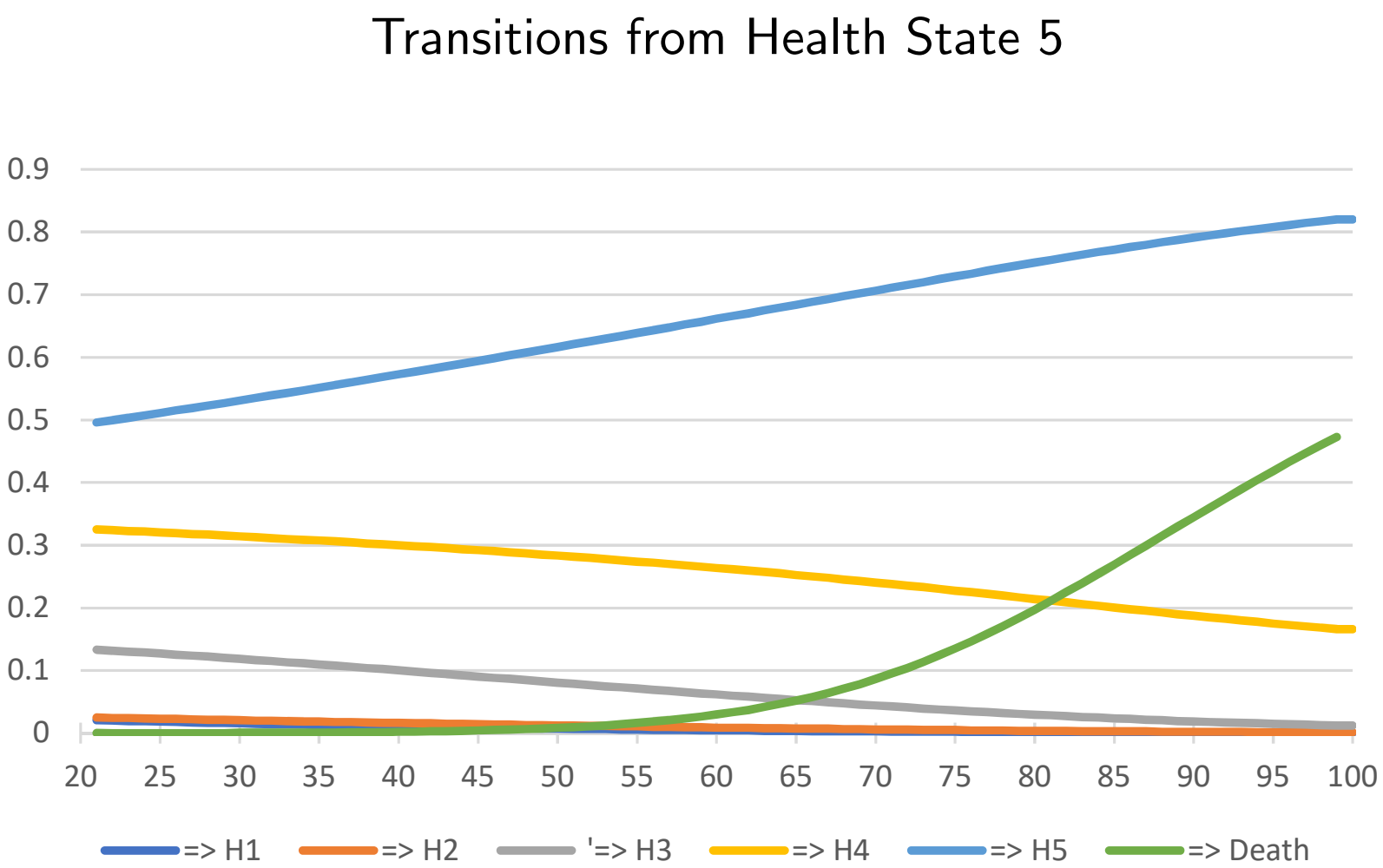
Health Transitions for those who pay for care



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Medical Loss Ratio and Excess Cost Growth

"**Medical loss ratio (MLR)** *is a measure of the percentage of premium dollars that a health plan spends on medical claims and quality improvements.*"

Source: healthinsurance.org

"**Excess cost growth** *is the extent to which health care costs per capita, as adjusted for demographic changes, grow faster than potential GDP per capita.*"

Source: Congressional Budget Office, 2017 LTBO.

Didem Bernard, Cathy Cowan, Thomas Selden, Liming Cai, Aaron Catlin, and Stephen Heffler. Reconciling Medical Expenditure Estimates from the MEPS and NHEA, 2007, June 2012. URL https://www.cms.gov/mmrr/Articles/A2012/mmrr-2012-002-04-a09.html.

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Budget Model